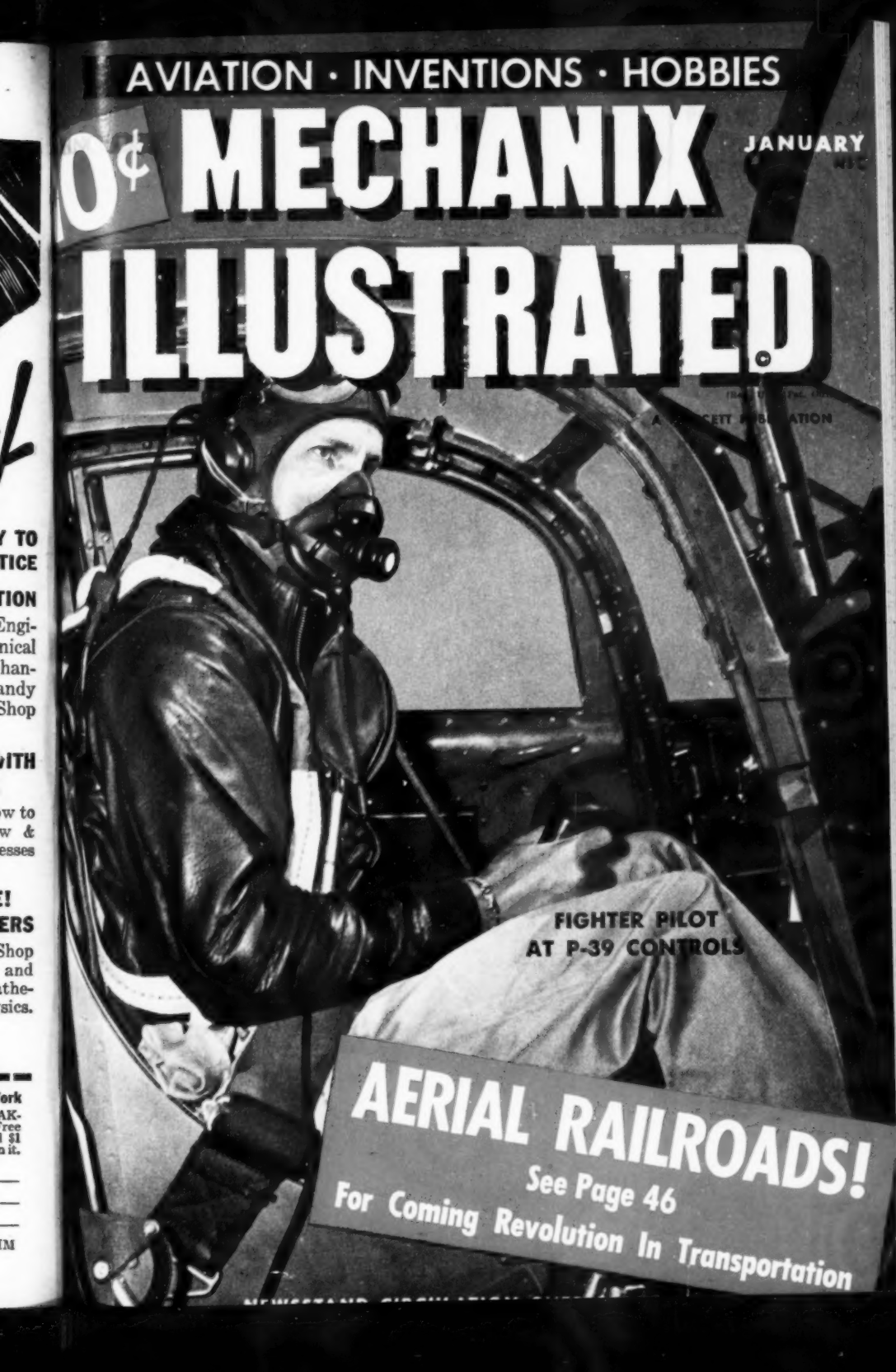
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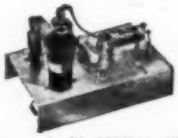

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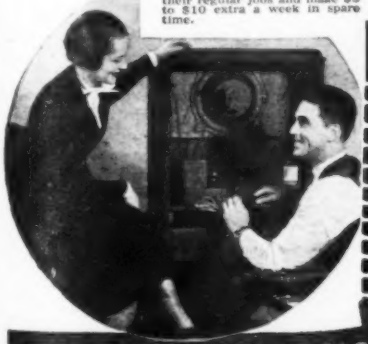

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JANUARY 1943

MECHANIX ILLUSTRATED

VOL. XXIX NO. 3

W. H. FAWCETT, Jr., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Norman C. Lipton, *Photography;* Thomas J. Naughton, *News*

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On the cover: A U. S. Army fighter pilot at the controls of a P-39, also known as the Airacobra, wearing the special mask used for flying above 30,000 feet, and a throat-microphone. Kodachrome by Rudy Arnold.

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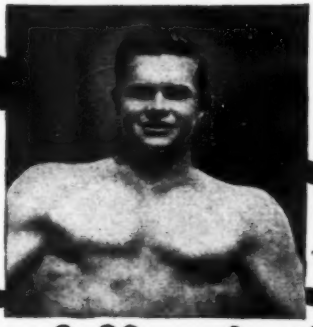

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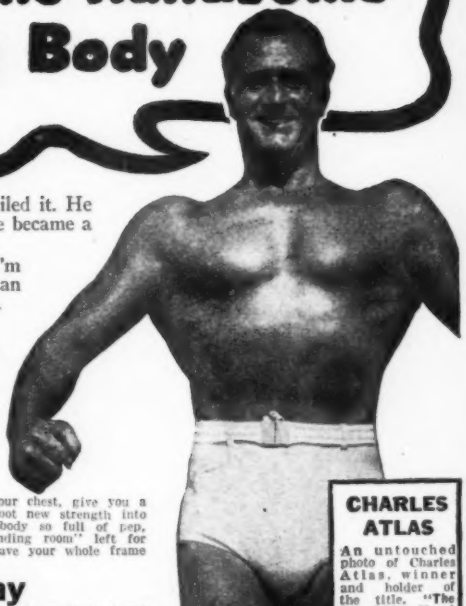

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YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Because of the great number of letters he receives each month, he cannot attempt to send personal letters to all who write him, but must confine his replies to those which he can answer in his column. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Pneumatic Tire

J. Thomas Skerry of Montreal, Quebec, Canada, sends us sketches and a description of a new form of pneumatic wheel which dispenses with the usual metal wheel parts. In keeping with our policy not to disclose details where an invention to us appears to possess merit, no further disclosures of the construction are given here.

ANSWER: *We hold that this combination could be put to practical use after being modified considerably, but perhaps not for aeronautic or automotive fields. Always evident is the great danger of collapse of your tire when partially deflated. Such danger is not great with present constructions.*

As we see it, your combination appears to be a modification of the early doughnut tires, but is more simple to manufacture. We think it could be adopted in toy manufacture when pneumatic tires are indicated, with a substantial saving in cost of materials and assembly. We would therefore recommend that you investigate the possibilities as they would apply to toys; hence, would suggest that you have a patent search made. Naturally, any protection which you might obtain for a small unit also would apply to a larger structure.

Wrist-Type Pencil Sharpener

Raymond E. Darling of Oakville, Iowa, sends us a diagram of a pencil sharpener which can be attached to the wrist. He writes: "I have tried to sell this item a few times but have not had any success. I would appreciate your criticism or recommendations."

ANSWER: *Contrary to your opinion we do not believe that your wrist-type pencil sharpener can be made as inexpensively as the ordinary vest-pocket style because the former does not require the strap for wrist attachment nor is it necessary that those straps be mounted on the sharpener—an added manufacturing cost.*

Neither can we see the great advantage of having the pencil sharpener attached to the wrist. If pencils must be sharpened so frequently that a unit of this type would be found desirable, then a speedy, desk-type sharpener is preferable.

It is our opinion that you might have investigated this field before attempting to protect it. Fortunately, no great expense has been entailed. We would certainly not suggest that you exert too much energy in trying to sell the item. Instead, apply that energy toward the development of something more saleable.

Spring-Wound Motor Generator

Frank Melton of Gastonia, N. C., writes that he has soldered together a small clock mechanism and a home-made armature (generator, we presume) and with it operates a small portable radio. He asks for our opinion.

ANSWER: *Many spring-driven generators have been built in the form of small flashlights. The current obtained from these is sufficient to light a lamp to incandescence. No doubt these could likewise be utilized for the operation of a small radio receiving set.*

The "A" batteries of these sets are quite inexpensive and are easily replaced. In fact, you can purchase at least 200 such "A" batteries for the price of a spring-driven generator of this type.

On the other hand, if you could develop a unit which would operate for a period of 12 hours without using too large a spring you would have something really worth while. The problem here would seem to be to try to develop a spring-driven unit which will function for a long period of time and which can be manufactured at a very low cost.

Protecting Inventions

L. W. Benson of Denver, Colo., writes: "Large corporations are in a position to employ attorneys to watch their interests in inventions. I feel that the amateur should be able to protect his invention just as well. Please advise me how I may be sure of protecting an invention."

ANSWER: *The "amateur" inventor can be just as sure of protecting his idea as any large corporation because he also can employ attorneys to look out for his interests.*

Just as you would visit a specialist if you needed a surgical operation, you should also go to a specialist if you want to protect an invention

[Continued on page 186]

INVENTORS AMERICA NEEDS YOUR IDEAS

In War and in Peace

Your country—in fact the whole civilized world—is in crying need of new ideas—these new ideas, YOUR IDEAS, must lead not only to victory in war but to prosperity in the peace which will inevitably follow. TIME MARCHES ON—today's inventions are tomorrow's craftsmanship, and post-war prosperity and readjustment will demand the creation of thousands of simple things that will win recognition—perhaps wealth—for you. TIME MARCHES ON and you march with it—or it passes you by.

Peace Is Coming

Factories now converted to War Production for the duration are already buying new inventions. They must take up NEW IDEAS in order to continue in business when the war ends. That's the time when new improved articles will be rushed onto the market and the lucky patent holders will reap the profits.

NOW IS THE TIME TO PATENT YOUR INVENTION

No matter who you are, where you are —no matter what your invention is, NOW is the time to apply for a patent. By delaying you may not only lose your rights, but you may miss some immediate opportunity of making money. When a house is burning down, it's too late to get fire insurance. When a market already exists for your invention, then it may be too late for you to apply for a patent.

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Chips FROM THE Editor's Workbench

Contest!

WELL, boys, the great contest is on again! If you didn't win last year, here's another chance to grab yourself a swell Aeronca trainer airplane—or any one of scores of other swell prizes, all absolutely free!

We know thousands and thousands of you have been waiting for the announcement. You'll find the official announcement of the Third Annual MECHANIX ILLUSTRATED Word Contest on page 58 of this issue. And, from past experience, we know it's going to give you a real thrill.

The first two MI contests, last year and the year before, were real sensations in the publishing world. Imagine: More than 110,000 of you entered those first two contests! That was an unheard of total of entries for such a contest in our field.

We think we know the main reasons why so many of you have entered our contests in the past:

1. First of all, our contests are real fun. They're games that are more fun than a circus just to play. Thousands and thousands of entrants have told us they got into the game just for the kick of playing it.

2. Next, our contests are the fairest that can possibly be devised. Our contest is a pure game of skill. Your own total score determines your place in the prize list—with no fancy slogans or "twenty-five words or less" entering into the decision of the judges.

3. Next, our contest is one that *anyone* can enter. No special skill is required.

4. And, finally, TAKE A LOOK AT THOSE PRIZES!

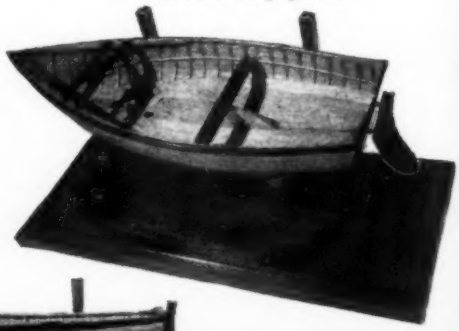
This year we have a brand new game for you to play—one with an added kick to it, yet which retains all the good features of last year's game. It's called "BUILDWORDS." We know you're going to get a thrill out of it when you see the first "BUILDWORDS" puzzle in the February issue of MI.

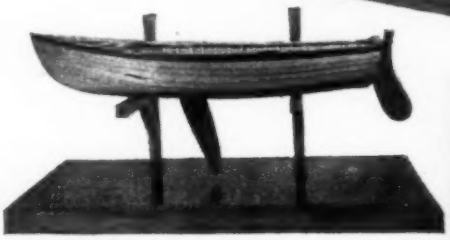
So sharpen your pencils, people! Get on your marks and get set! And whatever you do, get the February issue of MECHANIX ILLUSTRATED for the first "BUILDWORDS" game!

Secret Agent

WE THINK you'll be interested in "Inside a Nazi Sabotage School," which you will find on page 35 of this issue. It's the first article by a

[*Continued on page* 16]





John A. Livingston of 111 Storrs Ave., Braintree, Mass., started making this splendid example of the modeler's craft when a freshman at Massachusetts Institute of Technology and finished it four years later when he received his degree in Naval Architecture and Marine Engineering. *Prototype* is an M.I.T. sailing dinghy; he worked from the same plans used in constructing the dinghies, and used the same wood: pine, cedar, mahogany, etc. Scale: 1" equals 1', making the model 12½" long. Construction photo *at far right* shows the partly-planked model atop forms around which the ribs were bent. *Lower* photo shows the clamps which were used to hold the planks in place while cement hardened. Clamps consisted of three bits of wood and a rubber band to provide pressure. "The clamps are exceedingly handy," Mr. Livingston writes. He reveals that the brackets upon which the finished model is displayed *(top views)* are like those upon which the real dinghies are stowed in Tech's boathouse. Reader Livingston's excellent photographs and craftsmanship earn him this month's top Workbench award of $5.00 plus a MECHANIX ILLUSTRATED Certificate of Merit.

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Editor's Workbench Chips

[*Continued from page 14*]

real "underground agent" to be published by MI, and it describes in detail the workings of the secret Nazi schools for training saboteurs—men like the six Nazis who were executed by the U. S. recently after they had been landed from U-boats on our shores.

The author of this article, who signs himself only as "S. K.," was an underground agent in Germany and Italy for many months before he finally escaped to America. He helped organize sabotage, himself, against the Axis. His thrilling story has been told in the recent best seller book, *Agent in Italy*.

If you work in a war plant, we believe reading this article in MI will help you to be on guard against Nazi sabotage methods in your own plant. For always remember, the Nazis are going to make every effort they can to wreck or stall American war production. And "Forewarned is forearmed!"

Reminder To The U. S. Navy

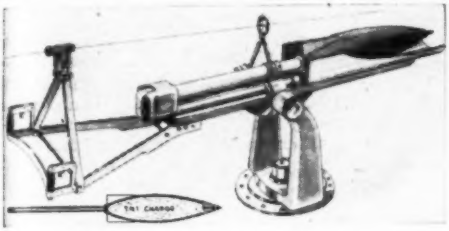
IN THE July issue of MI, we ran a suggestion by Mr. Jacques Martial and Mr. Robert Scull, New York industrial designers, for a gun which would *shoot* depth charges. The idea of this gun was that it be used as a protection against torpedoes. Martial & Scull pointed out that in many cases ship crews have been able to see torpedoes approaching their ship and have been forced to stand helplessly by until the torpedo struck, unable to do anything about it. They suggested that depth charges could be shot at the torpedoes, to blow up the "tin fish" before they struck the ship.

WHEN WINTER IS COLD

C. T. Schaefermeyer, of Steamboat Springs, Colo., made this efficient snowplow from scrap material and a ½ h.p. Briggs and Stratton washing machine motor. The plow cylinder is made from a 100 lb. Texaco oil drum cut in half. The rotor of the rotary plow unit is made from the turntable of an old phonograph. The rotor disc is 12" in diameter and the oil drum cylinder surrounding it is 14" in diameter. In operation, the plow throws the snow a distance of 15' or more. This snapshot brings Mr. Schaefermeyer a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

Here is a reproduction of their design for such a depth-charge-shooting gun:



Now we bring up the subject again because of a couple of stories we have read recently in the newspapers. The first quotes a survivor of the aircraft carrier *Yorktown*, Sam Malone, Machinist's Mate 1st Class, of Boyce, La.

"We saw the torpedoes coming at the *Yorktown*," Machinist's Mate Malone was quoted as saying. "Our anti-aircraft crews tried to explode the Jap torpedoes by firing at them with our anti-aircraft guns. But the torpedoes were too deep in the water for our anti-aircraft guns and luck was against us. If the torpedoes had been a little nearer the surface, we might have hit a couple of them."

Or, if, instead of anti-aircraft guns, which can-

LAMP SIGNING OFF

Dick Mast (W6SW), of 423 East E Street, Ontario, Cal., built this unusual lamp from an old 204A type 250 watt transmitter tube. The base is mahogany, and contains a transformer which lights the filaments in the tube. A 3-way socket wired on the top of the tube carries standard light bulbs. A $3.00 Workbench award and a Certificate of Merit go to Mr. Mast.

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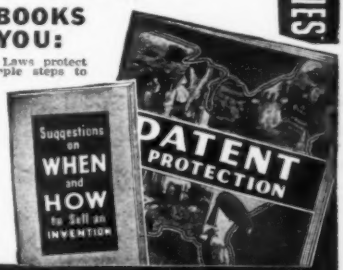

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Editor's Workbench Chips

not shoot accurately beneath the surface of the water, the gun crews had had a depth charge gun, which would explode a charge deep in the water in front of the torpedoes!

The second news story quotes a survivor of the destroyer *Porter*. This eye-witness says that an American dive bomber saw a Jap torpedo approaching the Porter and dropped a bomb on the torpedo, blowing it up before it struck the ship! We think this demonstrates pretty well that there is something to our sugggestion for a depth-charge gun.

Mind Over Manta

Model Builder Sought

The editors of a mechanical and model building magazine of 1501 Broadway, New York, are attempting to locate an Arthur Gray, a model airplane builder, believed to reside in the Plainfield area. The editors would appreciate any information concerning the model builder.

THE above clipping from the Plainfield *Courier News* (N. J.) was the climax of an interesting little story which might have come from the files of the Missing Persons Bureau—but didn't. Those of you who are model airplane fans will like this story, because it concerns the *Manta* gas model U-control plane whose plans you will find on page 122. It will also give all you readers an idea of the lengths the editorial staff of MI goes to in order to bring you a How-To-Build article that it thinks you will consider worthwhile.

One day a well-known commercial photographer, who shall remain nameless, came into our office bearing pictures of a model plane meet he had attended the previous week-end. One of the pictures showed a high-speed and very successful model of the famous *Manta* fighter, now undergoing tests for the U. S. Army. This model had

BUILT IN BED

Lefty Caldwell, of Mountain View Sanatorium, Lakeview, Washington, built this realistic model of an F4B3. The construction work was all done while he was confined to his bed, and the completed model looks good enough to have been turned out of a fully equipped workshop. Nice work, Lefty! Mr. Caldwell gets a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

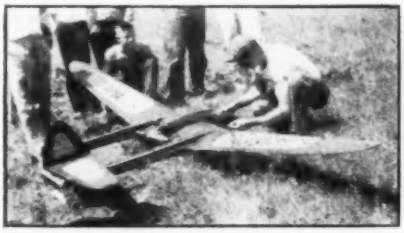
won various trophies at the meet, and was interesting for its originality and beauty of design as well as its outstanding performance. Sooo—we asked Mr. Photographer for the name and address of the builder. He had the name, but not the address, which he thought was somewhere in the vicinity of Plainfield, New Jersey. A letter sent to General Delivery, Plainfield, was returned unopened, so we contacted the Plainfield *Courier News* and told them of our quest. Next day we had a special delivery letter from Mr. Gray, which resulted in MI obtaining the plans for this fine model. We trust that all you readers will be properly grateful to Mr. Gray and MI—AND the *Courier News*.

Keep The Home Fires Burning

A GREAT deal of advice has already been spoken and written on the subject of heating your home this winter with the maximum economy of fuel that the war effort demands of every civilian. Much of this advice has seemed conflicting and slightly bewildering to Mr. Average Home Owner, so we thought it was high time for *someone* to really comb out the facts and tell in understandable language, plus understandable diagrams, just how to beat old man Frost and still keep your fuel consumption down to, or below rationing levels.

Accordingly, we started with the premise that no matter how well a house seems to hold heat, it can be made to hold it better, and compiled the article you will find on page 104. We modestly think we have whipped together some comprehensive and honestly helpful ideas, and whether your house is old or new, you'll want to check it against the sketches that show all possible weak-leak points. You might find out, for instance, that a few inexpensive storm windows, a bit of weather-stripping, or a simple caulking job around the window frames will save you as much as 33% of your fuel—and still keep the house at pre-war temperatures.

PLUGGING IN THE BOOSTER



Mr. C. Kallaway, of Rt. 7, Box 609A, Tacoma, Wash., built this XP-3 model from MODEL BUILDERS' HANDBOOK plans. His friends look on above as he plugs in the booster batteries in preparation for a start. It's a nice looking job and it brings Mr. Kallaway a $3.00 Workbench award and a Certificate of Merit.

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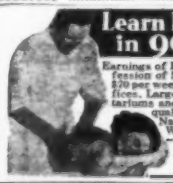

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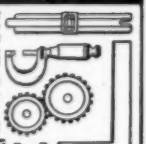

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Editor's Workbench Chips

Ode To A Kink

ONE of our slightly dizzy workbench friends sends along this bit of "poetry":

I read the stuff on how to build
From all the household trash—
And how to get up paint that's spilled
And weatherstrip the sash.

So then one night it came to me
To tear my car apart—
I'd seen a kink—Page ninety-three—
OLD CARS MADE QUICK TO START.

I labored on, the hours passed—
The weeks rolled into years,
While in the shop, the junk amassed;
Old pots and pans and gears.

And then one day a wagon came
My keeper helps me now.
The car's progressing just the same—
Some day she'll start—somehow!

HERE'S a recently-published official statement by the House of Representatives Military Subcommittee on Aviation of U. S. Army plane types, in which you might be interested. For a detailed report on the performance of these planes in combat, and on how they compare with the planes of other nations on both sides of the war, see page 39.

FIGHTERS

P-38; Lockheed, 2 engine, single place, high-altitude; up to and including P-38G model, powered with American-built Allison liquid-cooled engine. P-38, Lightning I; P-38, Lightning II; P-38E, Lightning II; P-38F, Lightning II.

90 MILES TO THE GALLON

George D. Suttles, of 327 Currabee St., Toccoa, Ga., built this fine power drive for his bike using a ¾ horsepower Briggs & Stratton motor. The motor is hinged at the back, the front end rising up to tighten the pulley belt. George tells us that he thinks MI is swell. His bike is swell too, and it brings him a $3.00 Workshop award and a Certificate of Merit.

Editor's Workbench Chips

P-39; Bell, single-engine, single place, medium-altitude; all P-39's up to P-39Q model, powered with American-Built Allison liquid-cooled engine. Airacobra.

P-40; Curtiss, single-engine, single place, medium-altitude; P-40, B, C, D, and E models, powered with American-built Allison liquid-cooled engine. P-40-F model powered with American-built Rolls-Royce liquid-cooled engine. P-40B and C, Tomahawk; P-40D and E, Kittyhawk; P-40OF, Warhawk.

P-47; Republic, single-engine, single place, high-altitude; all P-47's up to P-47G powered with American-built Pratt and Whitney air-cooled engine. No British designation. (Universally known as the Thunderbolt.—Ed.)

P-51; North American, single-engine, single place, medium-altitude; powered with American-built liquid-cooled Allison engine. Mustang.

LIGHT AND MEDIUM BOMBERS

A-20; Douglas, 2-engine, multi-place, medium-altitude, horizontal light bomber; all A-20 incl. A-20G models powered with American built Wright air-cooled engine. (A-20A, B, C) Boston III. Havoc II.

A-24, Douglas, single-engine, single place, low-altitude, dive bomber; all A-24's (A & B models) powered with American-built Wright air-cooled engine. SBD, A-24.

A-25; Curtiss, single-engine, two place, low-

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For two years Lloyd D. Youse of Hoagland, Ind., has built himself small garden tractors—and the second, above, is quite an improvement on his earlier attempt, he reports. "It is well-balanced and compact, and does a good job cultivating—as the neighbors agree! Using the complete differential from a model-A Ford made a great difference in efficiency." Power is supplied by a used Briggs & Stratton motor, though it would take a larger motor if Mr. Youse could find one. Wheels are from an old disk; he cut old casings and used strips for tires. All in all, this MI reader invested $18.75 in his ambitious project—for the report and photographs of which we're rewarding him with $3.00 and a Certificate of Merit.

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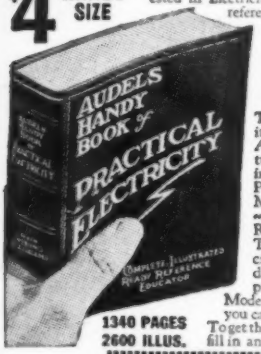

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(pages 27-31)

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Editor's Workbench Chips

altitude, dive bomber; powered with American-built Wright air-cooled engine. No British designation.

A-28A; Lockheed, 2-engine, multi-place, medium-altitude, horizontal, medium bomber; powered with American-built Pratt and Whitney air-cooled engines. Hudson IV.

A-29; same as A-28A; all A-29's (A-29 and A-29A models) powered with American-built Wright air-cooled engines. Hudson III.

A-31; Vultee (Northrop) single-engine, two place, low-altitude dive bomber; powered with American-built Wright air-cooled engine. Vengeance.

B-25; North American, 2-engine, multi-place, medium-altitude, horizontal, medium bomber; all B-25's (B-25, A, B, C and D models) powered with American-built Wright air-cooled engines. No British designation. (Commonly known as Mitchells.—Ed.)

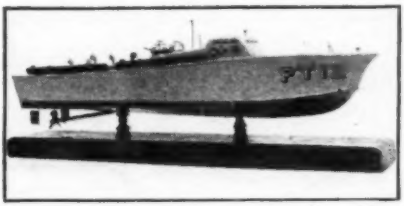
B-26; Martin, 2-engine, multi-place, medium-altitude, horizontal, medium bomber; all B-26's (B26, A, B and C models) powered with American-built Pratt & Whitney air-cooled engines. Marauder.

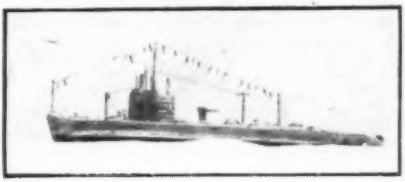
HEAVY BOMBERS

B-17; Boeing, 4-engine, multi-place, high-altitude, horizontal, heavy bomber; all B-17's (B-17, B, C, D, E and F models) powered with American-built Wright air-cooled engines.

B-24; Consolidated, 4-engine, multi-place, high-altitude, horizontal, heavy bomber; all B-24's (B-24, A, C, D and E models) powered with American-built Pratt & Whitney air-cooled engines. (B-24A and C, Liberator, B-24D and E.) Liberator II.

MODEL FAN BUILDS FROM MI





Anthony A. Kloska of 3066 Haussen Court, Chicago, Ill., recently completed the PT12, U. S. Navy patrol-torpedo boat, top above, and also the model of the U.S.S. Seadragon submarine, lower photo. Both are solid wood. The PT12 is 13 inches long and "serves as an excellent desk model," Kloska says. He gets a $3.00 check and a Certificate of Merit.

Popular Patents

Rifle Bullets That Flash

Riflemen or machine-gunners in future will have an advantage now possessed only by artillerymen, who can tell where their shells fall by watching the flash or smoke of the explosion, and thus correct their aim. This improvement in small-arms fire control is expected to result from a new-type bullet on which U. S. Patent 2,288,627 has just been issued here to Frank Kowalski, Jr., now with service in the Army.

Small-arms bullets, the inventor points out, register their fall only when they drop on dusty ground or a relatively flat water surface. He undertakes to remedy the situation by providing hollow bullets, with the metal very thin near the point, containing a smoke-making compound for daytime use, or an incendiary mixture that will make a flash at night. He states that in actual tests on the range these bullets have shown up well.

Rights in the patent are assigned to the government, without royalty payment to the inventor.

"Squeeze-Down" Bullet

Another bullet is the invention of a German, Waldemar Born, of Stuttgart, but application for the patent (No. 2,288,604) was made over a year ago, before this country became involved in the war. Herr Born's invention belongs to the class sometimes called "squeeze-down" bullets, which are intended for firing through rifle bores that diminish in caliber toward the muzzle, to secure greater powder pressure and hence higher velocity.

Around a rifle bullet of conventional type, having a little less than the caliber of the bore at the muzzle, there is a second envelope of metal, with one or more hollow bulges around its middle, of the caliber of the bore at the breech. This takes the rifling and spins the bullet, and at the same time is squeezed down to the muzzle caliber as it progresses through the bore.

Improvement In Gun-Casting Mold

Another invention of warlike purpose is offered by W. G. Donald of Philadelphia (also now in Army service) and J. L. Martin, of Lowell, Mass., for government use without royalty. It is a mold for casting field guns, belonging to the category known as centrifugal casting molds. The mold, hung vertically, is spun rapidly after being filled with molten steel. This sets up a centrifugal force, which causes the densest and strongest part of the metal to form on the outside. The present invention improves this mold by making its suspending flanges just a trifle less than a tight fit in the suspending rotor, to allow for expansion when it is hot, and thereby to prevent the "freezing" of the mold in the rotor. The patent is No. 2,288,614.

[*Continued on page 25*]

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State of Connecticut } ss.
County of Fairfield }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Gordon Fawcett, who, having been duly sworn according to law, deposes and says that he is the Business Manager of MECHANIX ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editors, managing editor, and business manager are; Publisher, Fawcett Publications, Inc., Greenwich, Conn.; Editors, Roland Cueva, Manhasset, L. I., N. Y., and Donald Williams, Brooklyn, N. Y.; Managing Editor, Ralph Daigh, New Rochelle, N. Y.; Business Manager, Gordon Fawcett, Stamford, Conn.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Fawcett Publications, Inc., Greenwich, Conn.; W. H. Fawcett, Jr., Norwalk, Conn.; Marion Bagg, Tulsa, Okla.; Roger Fawcett, Larchmont, N. Y.; Gordon Fawcett, Stamford, Conn.; Roscoe Kent Fawcett, Greenwich, Conn.; Allan Adams, Greenwich, Conn.; W. H. Fawcett Trust, Greenwich, Conn.; Roscoe Fawcett Trust, Minneapolis, Minn.; John Fawcett, Los Angeles, Cal.; Virginia Lee Buckley, Santa Barbara, Cal.; Fawcett Publications, Inc., Greenwich, Conn.

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is _____. (This information is required from daily publications only.)

GORDON W. FAWCETT,
Business Mgr.

Sworn to and subscribed before me this 28th day of September, 1942.
[Seal.] LILLIAN M. BUSHLEY,
Notary Public.
(My commission expires February 1, 1943.)

Popular Patents

[*Continued from page 23*]

Television To Aid Air Pilots

Television comes to the aid of the airplane pilot who cannot see what is ahead of him or the ground because of obscuring fog or haze. Use is made of infra-red or long-wave light rays which, as is well known, will get through where ordinary light will not. This light is just as invisible to the human eye as ultraviolet or short-wave light. Photographs can be made by means of it; this is frequently done by reconnaissance planes. But the pilot lost in thick weather has not time to develop a picture. In the invention of Harold A. Adams, of Bakersfield, Calif., the infra-red image is formed in a television transmitter and sent by wire, instead of through the air, to the receiver on the instrument board. Thus the invisible infra-red image is converted instantly into a visible image in which all movements can also be seen. The camera may be located under the fuselage or in some other convenient place, with means to turn it in any direction in which the aviator may wish to "look." Mr. Adams' invention is covered by patent 2,288,871.

Chemicals Recovered From Garbage

The present national drive to get value out of all manner of scrap and waste materials might be aided by a garbage-reducing system on which patent 2,288,757 was issued to R. J. Thompson, of Michigan City, Ind. In it the garbage is first ground fine, then digested by bacteria. The end-products of this fermentation, principally gaseous, are treated with sulphuric and nitric acids. Mr. Thompson states that his process recovers nitrates for explosives and fertilizers, also useful dyestuffs and other chemicals. He further claims that the apparatus is kept so completely gas-tight that the process is completely odorless.

Compressed-Air Machine Gun

A weapon not of yesterday but of a possible tomorrow is the compressed-air machine gun protected by patent 2,278,799, granted to an Italian inventor, Aristide Riccardi of Rome, who applied for it in 1938.

Signor Riccardi's invention represents the latest effort in a perennial search for a gun that can be "fired" without using powder for a propelling charge. In it bullets, which the inventor says may be made of "fiber or ebony" as well as lead or steel, are fed in through a tubular magazine and blown from the muzzle by a blast of highly compressed air.

Proposals for a weapon of this kind are always attractive, because they promise silent, flashless, smokeless, recoil-less operation with very cheap ammunition. On the other hand, they are necessarily short-ranged and not very accurate, and they require the use of heavy, not-easily-portable machinery for supplying the compressed air.

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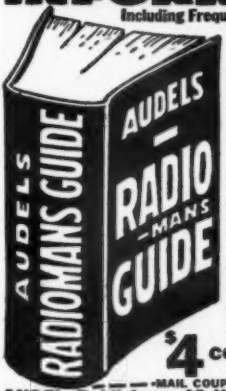

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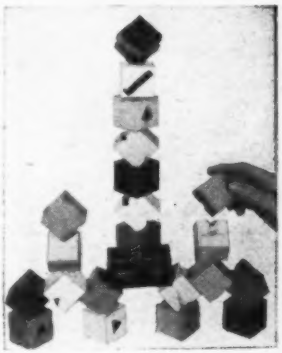

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Popular Patents

[*Continued from page* 25]

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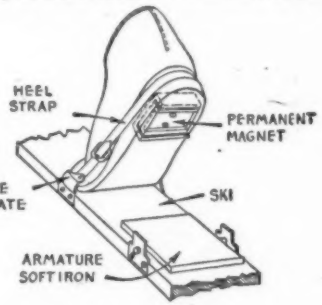
* * *

A new use of magnetism is shown in a patent allowed to Frederick Crowther of Scotia, N. Y. In skiing, in order to obtain proper control of the skis, it is desirable in most circumstances to keep the heels against the skis. By means of the new harness of this patent such ski-heel contact is obtained by means of a permanent magnet in the heel strap of a ski boot. An armature of soft iron



is associated with the ski to provide a locking contact with the magnet. The elements may be reversed, that is, the magnet may be on the ski and the armature in the heel strap. In operation, the heel will be normally held in association with the ski by the magnetic attraction between the magnet and the heel plate. However, pressure exceeding a certain amount will cause the heel to be withdrawn so that in case of a fall, danger of breaking a leg or ankle is minimized. In order to permit climbing on skis a brass cover plate can be used to break the magnetic contact between the two elements. (No. 2,276,826.)

[*Continued on page* 174]

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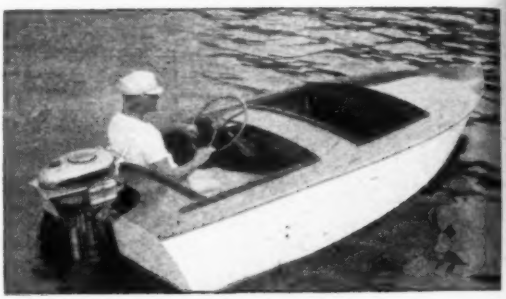
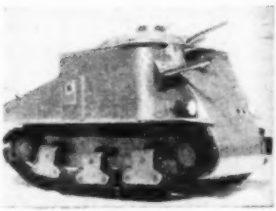
BOAT: *Frisky,* *left,* is a popular 17-foot Marconi rigged sloop that can be constructed of non-defense materials. *Blueprint No. 972, $2.50.*

MODEL, *below:* Designed after the famous *Monta* fighter, this unusual and beautiful model plane will go better than 75 m.p.h. It's a U-control job. *Blueprint No. 344, $2.00.*



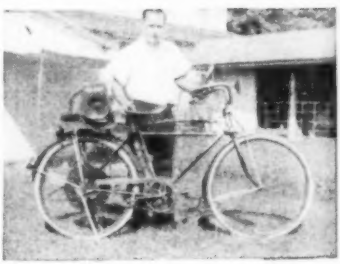
BOAT: *Above* is *Sportster,* a speedy 12½-foot outboard runabout. Will take any motor of from ten to thirty h.p. *No. 978, $1.50.*

MODEL: An electrically driven replica of the famous M-3 General Grant tank that maneuvers like the real thing by remote control. *No. 337, $2.00*



MODEL, *below:* Here's an action model that will give any boat model fan the thrill of a lifetime. You guessed it—a 26-in. model PT motor torpedo boat like the one Lt. Bulkeley smashed the Japs with. Completely detailed and powered with a midget gas engine. *Blueprint No. 330, Price $2.50.*

MOTORBIKE, *right:* The answer to rubber and gas rationing. If you own a bicycle you can install a small motor that will push you comfortably along on practically no gas! Plans show two types of installation, and include a bike sidecar. *Blueprint No. H-82, Price $1.00.*



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This picture, smuggled out of Germany, was taken at a Nazi school where spies are taught sabotage before being sent to America. The students are hooded to accustom them to moving in dark. Instructor, foreground, taps orders in code.

Inside a Nazi Sabotage School

by "S.K."

Underground Agent and Author of the Best Seller,
Agent in Italy

"THE first World War saw sabotage of enemy industry carried out on an organized scale for the first time in history. And we were very successful then. But compared to what we are preparing now, that was kindergarten. Today sabotage is a science."

That was how my former schoolmate, Josef Streber, began to tell me what he learned in Nazi sabotage schools. I had never liked Streber; he was one of those coldly fanatical Nazis, with a little bit of confidence-man in his character. The reason he came to see me that day in late November,

The initials "S.K.," representing the author of this article, are not his own, although the obviously disguised photograph at the *right* is actually a picture of the author. His true identity cannot be divulged because it would enable the Gestapo and Italian political police to identify secret agents and underground workers with whom "S.K." collaborated in Germany and Italy—men who are still fighting the Axis on its own soil. The full story of "S.K.'s" career, recently given wide publicity in *Life* magazine, has been told by the author himself in his recently published book, *Agent in Italy (Doubleday, Doran).* It describes his dealings with the Gestapo both in Italy and Germany, his methods of worming information from high Italian officials and Nazi army officers, his arrest, and his final desperately narrow escape to Portugal.

Eye-Witness Story!

1938, in my Italian silk importing office in Duesseldorf, Germany, was to obtain the names of some Belgian manufacturing plants he thought I knew. The last time I had seen him, on the street in Berlin, he had been wearing his black Gestapo uniform. But this time he was in mufti, even without the small gold Party emblem in his buttonhole. I led him on, which was not difficult because he was as proud of having graduated from the Lichterfelde sabotage school as a schoolboy just given his athletic letter.

From the Nazi viewpoint, Streber was well-qualified to be a saboteur. He had lived some years in Belgium, and spoke French, Walloon and Flemish perfectly. After two years of Gestapo training at the center connected with the concentration camp at Dachau, he had been enrolled for sabotage. Now he was bound for active duty in Belgium.

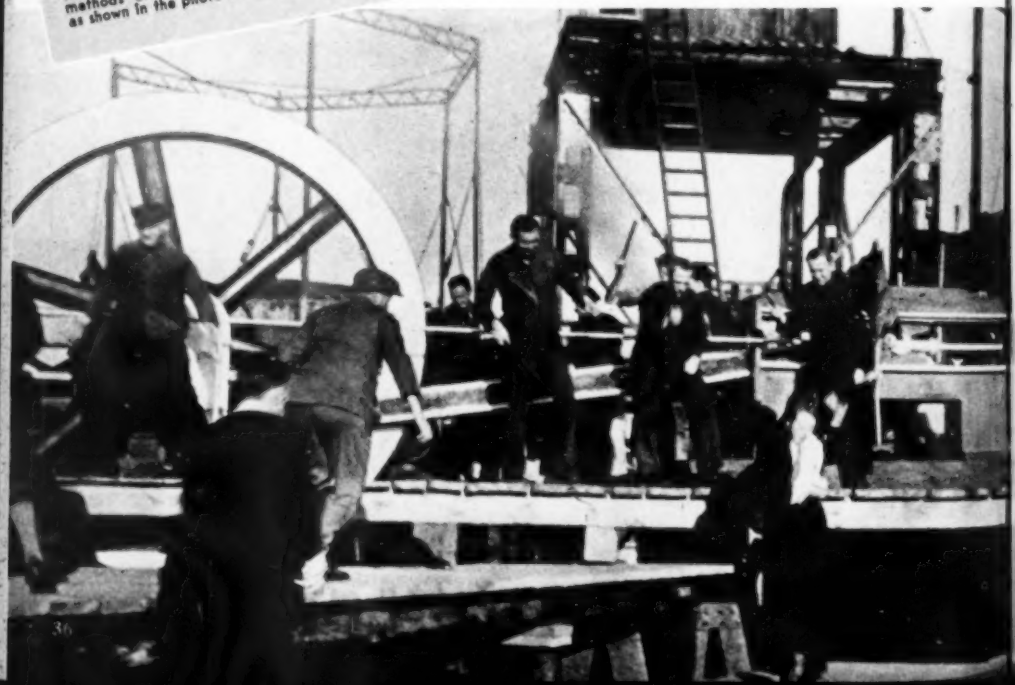
From him, that day and in ensuing conversations, I learned much of what follows; other things I confirmed in personal experience; later I put some of that knowledge to my own use through the anti-Fascist underground organization in Italy.

Some years before the war started, the German General Staff set up regular schools of destruction, in Lichterfelde (a Berlin suburb), Potsdam (near Berlin), Klausdorf, Koenigsberg, Warnemuende, and Pillkoppen. They are operated by the General Staff's intelligence service — Nachrichten-Abteilung—under the notorious figures, General Nikolai and Admiral Canaris. They are part of the Second Division of the General Staff, officially known as the Amtsgruppe Fuehrungstab Gruppe 2 Ausland. The Gestapo also operates similar schools at Gestapo training centers throughout Germany, but Streber, though a Gestapoman, was assigned to the Lichterfelde army school, which occupies the former cadet school on Zehlendorfer Street, a huge building with adjoining drill field.

He told me how numbers of saboteur candidates were brought back to Germany from the countries they were living in, to be trained and later returned to those countries. These men were selected through the universal organization of Germans abroad, the Auslands organization. They were subjected to rigorous physical and psychological tests, as well as exhaustive tests of their political reliability, and only then assigned to the various schools.

"I was in one of the usual small classes," Streber told me; "of only eight or ten. We worked fourteen hours a day and had only Sunday afternoons off. We couldn't leave the

In Siemens-stadt, near Berlin, Nazis have built a dummy industrial plant of wood, where saboteurs may practice methods of committing sabotage and creating riots, as shown in the photo below, smuggled out of Germany.

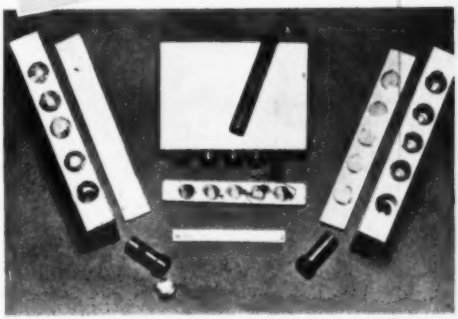


This scene inside a Nazi sabotage school was taken at Schulpforte, formerly a church school which has been seized and converted to Nazi party purposes.

school. The commandant, Colonel W. Hosse, was a very strict disciplinarian.

"We all took general courses, for instance, in industrial sabotage. We worked first from photographs, blueprints of models, to learn how to pick out the key locations in factories, railroad terminals and yards, shipyards, harbors and airfields. We learned what to look for—power control stations, for example, and where to look for them. We learned what parts of these installations are vulnerable to bombs, or fires; how to get in and out; the commonest kinds of building materials. Our teachers were factory architects and builders and engineers. After this general instruction we were given practical demonstrations. We learned, on real machines, how to damage them, by letting them run without lubrication, overpressure, tightening or loosing screws, oiling too little or oiling with lubricator containing fine sand. We learned easy ways of causing short circuits, by cutting wire insulations to leave the wire itself exposed. We also learned ordinary methods by which orders are given in different kinds of armament factories, and how to misunderstand them—deliberately, and so work incorrectly without being suspected of anything worse than stupidity."

This is the same system as the current French underground's "invisible sabotage," planned and carried out so that while the Nazis know that sabotage has been committed,



Explosive detonators concealed in wooden blocks shown above were smuggled into the U. S. by Nazi agents landed from submarines. Six of these agents were later executed by the U. S.

no single step of it can be surely called anything but stupidity or error. The French underground recently reported an instance of sabotaging an entire trainload of farm machinery by sending the car containing the gear mechanisms off in the wrong direction. The enraged Nazis could find no evidence of anything but "error"!

Streber went on: "Then we were given psychological instruction by staff members of the Berlin psychological research laboratory

This picture, taken at Gestapo headquarters in Eastern Germany, shows saboteurs being dressed by Gestapo agents as Russian peasants and even as peasant women for infiltration through the Russian lines. Some are dressed as nuns.

under Lieutenant General Hans von Voss. They taught us how to move around without arousing suspicion, how to talk with other workers in a factory, make them dissatisfied with working conditions or wages, how to avoid surveillance by factory guards and police—in short, a rough course in espionage and demoralization.

"Then came instruction in explosives under Professor Karl Schuerter of the Kaiser Wilhelm Institute and his assistants. They taught us all about various explosives, how to use them effectively. We learned how to make incendiary bombs out of various chemicals, how to use fuses and detonators—even how to buy the various chemicals we'd need in ordinary chemist shops without attracting attention. The simplest sabotage bomb consists of two compartments separated by a copper partition. In one compartment is sulphuric acid, in the other a mixture of sugar and chlorate of potash. The explosion is timed by the thickness of the copper partition; the thicker it is the longer it takes the acid to work through, mix with the other, and detonate. We learned also how to conceal bombs, disguise them, as pieces of coal or wood, milk bottles, tools, cigars, even pieces of bread or pie. Fountain pens and pencils are too commonplace now. But a newer trick is a sort of Molotov cocktail—gasoline—in an open bottle left standing "casually" near where welders are working. One spark—and there's a fire. Steel wool soaked in gasoline is good for this purpose too. In fact, steel wool is a real godsend to us. A strand or two in a machine transmission—and pfft!

"After practical demonstrations in explosives, we took a course in electricity, given by Chief Engineer Karl Melmann of the Siemens Company. [Biggest German electrical company.—Ed.] He taught us how to sabotage all sorts of electrical equipment — dynamos, power lines, and so on; how to insure short circuits by water, or lack of oil. Also, how to use an ordinary pocket flashlight battery for a time fuse, and how to avoid the photo-electric detection devices so many factories have these days.

"From this we went to shortwave radio, for every saboteur must know how to send and receive by shortwave. We spent hours at our desk learning the Morse code; the instructor tapping messages with his fingers on the desk top, and we answering."

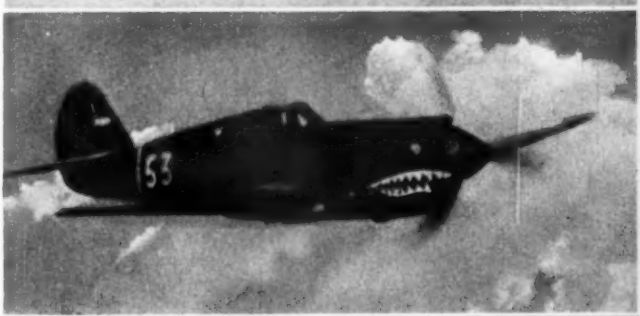
Morse code, by the way, is a favorite Gestapo device for communication between two agents meeting in a public place but unable to speak. One taps on the other's foot under a table. Another use of the Morse code is the length of drags on a cigarette to convey dots and dashes. Still another is the use of agreed musical records, broadcast by shortwave sender, during which a code message is sent. The receiver, knowing what to listen for, ignores [*Continued on page* 156]

HOW GOOD ARE OUR WAR PLANES?

Here's what the Office of War Information has to say about American war planes of all types. The facts are here—good and bad—and our ships are still tops.

P-38 Lockheed P-38 (Lightning) left—two-engine, liquid-cooled. It has had only limited tests in action, notably in the Aleutians. Its performance has been brilliant. Turbo-supercharged, it has excellent altitude performance. Spitfire shown on right.

P-39 Bell P-39 (Airacobra)—single-engine, liquid-cooled. A part sharer in criticisms heaped on the P-40, the P-39 has roughly the same limitations and the same positive virtues. Developments now being made in this design promise improved performance.



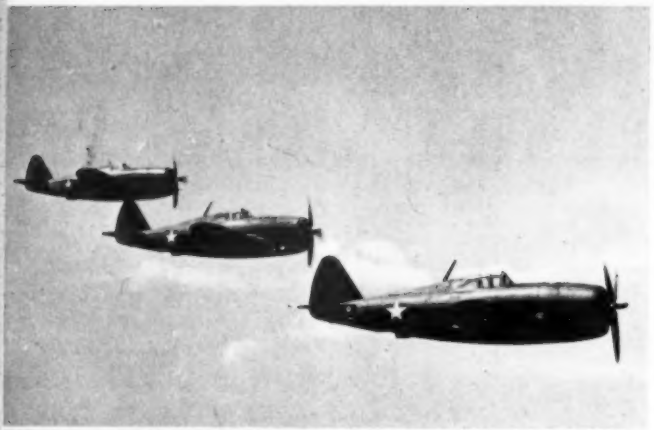
P-40 Curtiss P-40—single-engine, liquid-cooled. Most discussed of all U. S. combat aircraft, this fighter has gone through six major type changes. Best known now are the Kittyhawk and Warhawk (E and F). It has heavy hitting power, excellent armor.

FROM the government's Office of War Information finally came a calm, frank, and thorough answer to the question Americans had been asking for months: How good are U. S. warplanes?

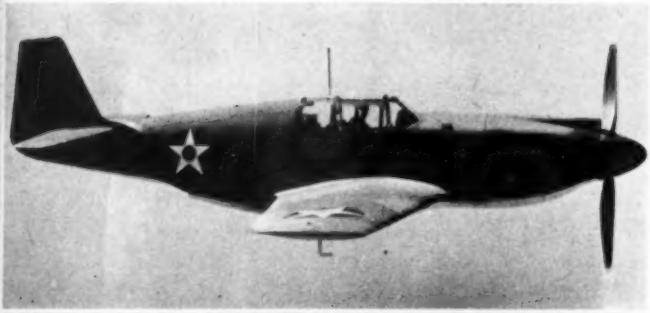
Briefly, the answer is this: some of our fighter planes, outclassed in the high-altitude fighting which takes place over Europe, are splendid weapons on the Russian, Egyptian, and Aleutian fronts. The Army's four-motored bombers like the Flying Fortress and Liberator have exceeded fondest hopes in performance. And U. S. medium, light, and scout bombers, are the finest in the world.

Wholeheartedly encouraging, isn't it? Later reports will be still more assuring because our newest, most promising types of planes, like the P-38 and P-47, by then will have undergone battle—and that is the test, as the OWI pointed out, that is the only valid one for any Army or Navy plane, whatever its type.

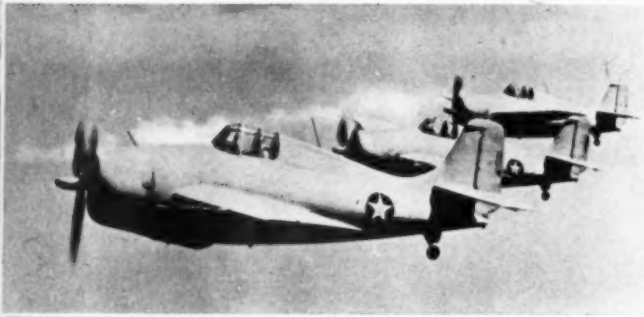
"Failure of the public to appreciate this fact, and the additional one that there is no all-purpose plane, has bred doubt and discouragement.



P-47 Republic P-47 (Thunderbolt)—Powered by one of the largest U. S. air-cooled engines, the P-47 has been thoroughly tested, is in service and in production. It is turbo-supercharged, heavily armed, and has greater speed than P-38 when high up.



P-51 North American P-51 (Mustang)—single-engine, liquid-cooled. Newest of the Allison-powered pursuits, one of the fastest fighters in the world, it has roughly the same limitations on altitude performance of other single-engined Allison powered craft.



F-4-F Grumman F-4-F (Wildcat)—single-engine, air-cooled with a supercharger. The Navy's standard fighter, as of today, the F-4-F is unquestionably the best carrier fighter now in battle service. These made a magnificent record against Japs.

From believing their warplanes the best in the world, some people have swung to a conviction that British, German, and Japanese planes are superior. Then, their hopes brighten by accounts of American air victories, they have gone back to their original optimism.

"The truth lies between the two extremes."

The United States' goal is a balanced air force, the report explained. Just as an army cannot be all tanks or all cavalry, an air force must have many types of planes—short-range, fast-climbing interceptors for defense against bombers; long-range, heavily-armed types to protect our own bombers; dive bombers, torpedo planes, reconnaissance craft, transports, photographic planes, coastal patrol planes, and so on.

In reaching that goal, the report said, the United States air forces have been hamstrung in the past by disagreement in their own fighting services as to the weight and power to be wielded by air power. Critical experts and laymen alike were described as unfair when they forgot the peace-minded past of the country, and the fact that as a nation we have been unwilling to spend the sums for aircraft development which we should have spent in preparation for the day when we would be at war.

For the U. S., this war's requirements are more varied than they are for any other combatant. In the Aleutians our planes operate over water in cold and foggy weather. In the Solomons, operations are in stifling heat and drenching rains. That the fighting, scouting, and bombing go on successfully nevertheless is tribute to the basic soundness of American design and

versatility of American crews.

"Some American warplanes are badly designed or ill-matched against the equipment of the enemy," the OWI admitted. "Some planes now in action have definite deficiencies, even within the purposes for which they were designed, but even such aircraft often have fought admirably because of their positive virtues and inherent soundness, despite such tactical handicaps as climate, inadequate air raid warnings, and other considerations of war. But it also is a fact that some American aircraft have proved excellent in every theater in which they have been employed."

On the basis of ten months of war, the OWI made this summary of how American planes have performed in combat:

The Navy went into the war with considerable quantities of aircraft that were not of the latest type, and unquestionably suffered losses that could have been avoided, had the latest equipment been available. But secret battle reports show that the latest floating-base aircraft of the Navy are superior in all types.

In battle areas in the Pacific, the disruption caused by the surprise Japanese attack, and the necessity of returning to bases inadequate to the technical demands of aircraft operation, imposed conditions no aircraft could meet fully. Yet there, as in China, the over-all battle score of Army aircraft has been much better than the enemy's.

In the vital European theater, our newest fighters have not been fully tried up to now. Yet appraisal of our older fighter types—the Bell P-39 and Curtiss P-40—compel the conclusion that they are not right for oper-

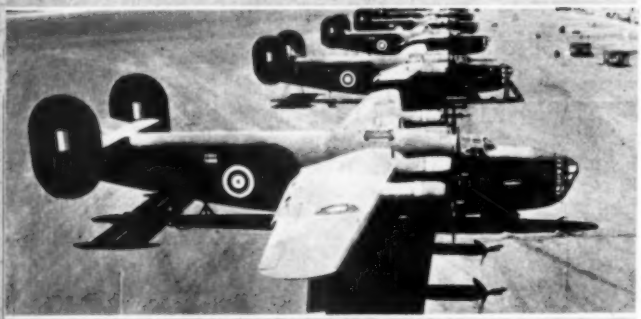
AVENGER Grumman TBF (Avenger)—single-engine, air-cooled. This plane made its debut at Midway. Bigger, more powerful, and in all respects more advanced than the TBD, the TBF is the best carrier-based torpedo plane so far seen in action in the war.

TBD Douglas TBD (Devastator)—single-engine, air-cooled. The Navy's standard torpedo bomber when we entered the war, this plane was as good as the best in service in any navy. Developments soon caught up with it, and TBF's are replacing it.

A-24 Douglas A-24 (Dauntless) (Navy SBD)—single-engine, air-cooled. The Navy's carrier-based standard dive bomber, this craft is the best in the world in its category. It will shortly be supplemented by a newer design that is now in production.

B-17-E Boeing B-17-E (Flying Fortress)—four-engine, air-cooled, turbo-supercharged. A tried and thoroughly tested model with an unequaled combat record, the B-17 has indicated by its work in the Pacific and Europe that it's a high altitude ace.

DB-7B Douglas DB-7B (Boston or Havoc) (Also called A-20)—two-engine, air-cooled. A light bomber widely used by the British in European and Egyptian theaters. Flexible in performance, it has also been employed with modification as a heavy fighter.



B-24 Consolidated B-24 (Liberator)—four-engine, air-cooled, turbo-supercharged. In the Pacific, Europe, and the Aleutians, it has shown itself a top flight performer capable of duplicating the world famed records established by the Flying Fortresses.

ation under today's high-altitude tactics in England. Both are outclassed in the high-altitude field by the British Spitfire and the German Messerschmitt 109 and Focke-Wulf 190. But it is one of the paradoxes of aircraft performance that the P-39 has proved a splendid weapon on the Russian and Aleutian fronts (where lower altitudes are the rule) and that the P-40 is a first-line fighter in Egypt.

The Army's four-motored bombers have proved superior in their categories in all theaters. Though critics only a few months ago considered the Flying Fortress unfit for battle over Europe, the report emphasized that the test of battle completely disproved this complaint. Actual employment of the B-17 over Europe has exceeded even the fondest expectations of its American proponents. It is capable of high-altitude day bombing of astounding precision, has great firepower, and toughness under enemy attack. This gave it decisive protection against enemy fighter attack, while its ability to operate at high altitude cut down its vulnerability to anti-aircraft fire.

It is a tribute to the determination of the Army Air Forces in developing this type of craft that the same kind of record has been made by the Consolidated B-24 (Liberator) in Egypt and in other areas.

U. S. medium and light bombers are the best in the world. They have been tested in all theaters. Our scout bombers, product of the Navy's long-time specialization in this destructive art, are also without peer among single-engine dive-bombers.

The firepower and protection of U. S. fighting

aircraft (guns, armor, and leakproof fuel tanks) are equal in all cases to the best our allies and the enemy have in the air, and in some cases are decidedly superior. In these necessities brought forth by the war, the U. S. was deficient when the war began. Conduct of the war by the British gave us an effective proving ground. Lessons learned by them and elaboration of some of their practices, particularly for planes built to their order in the U. S., served largely to remedy the deficiencies of December 7, 1941.

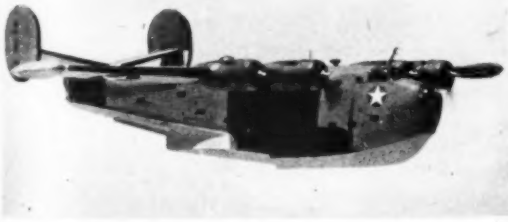
"It should be of great satisfaction to Americans that when these deficiencies were remedied, the job was done with armor and with guns previously developed in the U. S. Notable was the .50-caliber machine-gun with its superior hitting power, range and rate of fire; and the plane-borne cannon. The U. S. 37-mm. gun is the heaviest piece of ordnance carried by any fighter in the world."

After indicating the problems which face the aircraft designer, the report took up the matter of air-cooled vs. liquid-cooled engines. The only liquid-cooled engine of American design now in mass production and military use is the Allison, which drives the P-38, P-39, and P-40. Its development was late in starting (partly due to the popularity the air-cooled

[*Continued on page* 177]

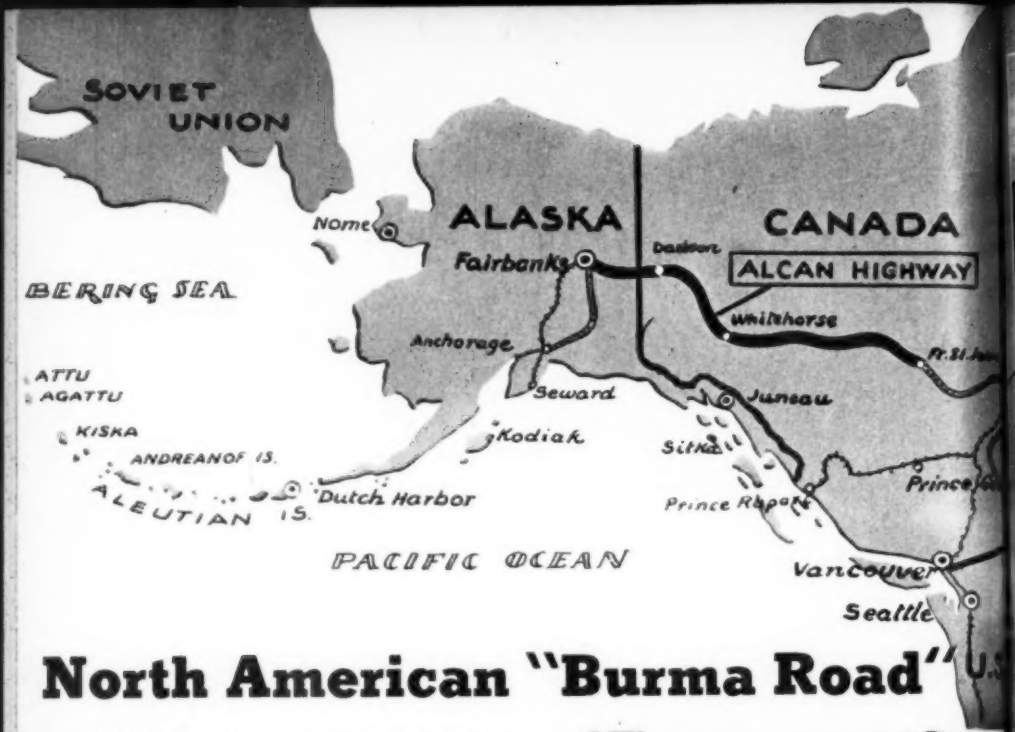
B-25 North American B-25 (Mitchell)—two-engine, air-cooled. A battle-tested aircraft of speed, long range, and good load-carrying characteristics, chiefly dramatized for the public by the raid on Tokyo. No plane on either side is equal to it.

B-26 Martin B-26 (Martian)—two engine, air-cooled. This one is also battle tested, compares in general with the characteristics and performance of the B-25. No nation but the United States, so far as is known, has a comparable plane in this class.



PBY Consolidated PBY (Catalina) two-engine, air cooled. This type is one of the "eyes of the fleet." Criticised for slowness, it's not designed for speed, but for endurance and toughness.

CORONADO Consolidated Coronado. Four-engine, air-cooled. Long range patrol and transport ship, this twin-rudder flying boat is rapidly proving itself in operation. A type fast becoming popular.



North American "Burma Road"

A YEAR early, Army engineers have flung a long-needed highway across mountains and muskeg bogs to Alaska. Beginning this month, soldiers and supplies in Canada and the U. S. can be hustled overland for the first time to thrust at Japan's heart from Alaska or repel an invasion of America or Siberia. The Army picked the 1,600-mile route, surveyed it, cut work trails, supervised construction, will patrol it, maintain it, convoy its war traffic. Canada will take over after the war, when it will lure tourists on the far-north auto trip they always hoped to make.

(Left) First actual construction step in thrusting the Alaskan-Canadian highway northward was shearing cuts through the forest which grows thick as grass in the area around Fort St. John, B. C. This was Army engineers' task. *(Above)* Brush and timber piles removed, bulldozers and road-builders smoothed the cuts into rough earth roads, which were then graded smooth.

Gravel trucks rumble over a sturdy pontoon bridge toward construction points.

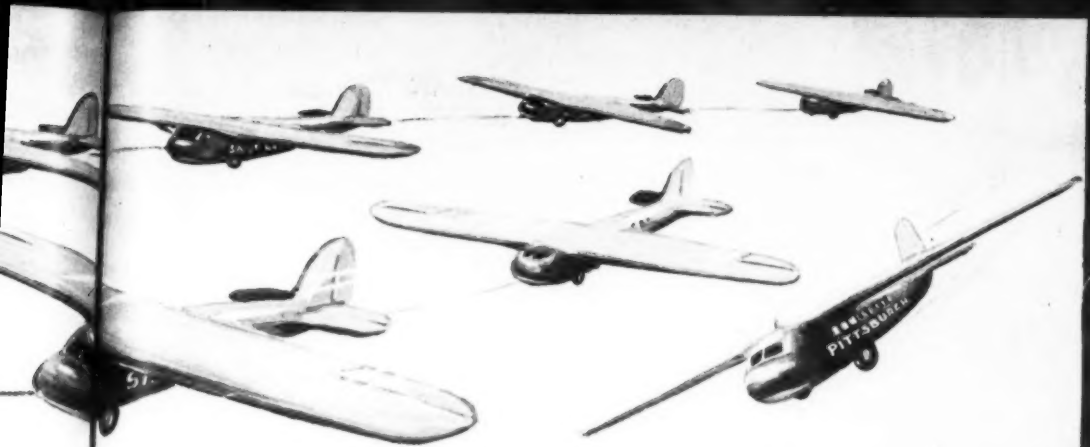
(Left) Workers had to wear masks on dusty stretches. Mosquitoes, no-see-ums, and other bugs were even more annoying than choking dust, but less dangerous.

(Below) 1,600 miles beyond this sign at Edmonton, Alta, is Fairbanks, road's end.

Muskeg, earthy mush except when frozen, was conquered with drainage and "corduroy"-type roads of gravel and close-set timbers. More gravel will form a serviceable truck highway. *(Right)* Grade on this stretch of the war road early in use was reduced by pushing earth and gravel to the bottom to make a fill. After the war: paving.

Fourth in the MI Series

"A WORLD YOU NEVER KNEW"



Aerial locomotives will haul tomorrow's trains through the sky. "Cars" glide off at each station.

OF TRANSPORTATION

by Donald G. Cooley

Designs by Fred Ripperda and Martial & Scull

"I DON'T see why you have to spend Saturday and Sunday in London, just when I'd planned on your mowing the lawn," your wife complains. "But if you're determined to go, I'll fly you down to the Minneapolis airport in the helicopter. I have some shopping to do in the city."

It's nice to have your wife act as your air chauffeur and you tell her so. It is a mere 200 miles from your Northwoods home to Minneapolis and you wouldn't mind taking

The flying "locomotive" flies low to pick up passenger-loaded gliders at "local" stops. The pick-up system has already been tested in actual use experimentally and proven practical.

the glider bus that picks up a local coach at Bemidji, a few miles away. Secretly, you would rather pilot the family plane which would make the trip in a little over an hour, but your son John has a dance date in Chicago and has spoken for the ship.

Anyhow, your wife gets such a kick out of her helicopter, which she learned to pilot at the age of fifty, that it's a sheer pleasure to watch her demonstrate how she can land on a handkerchief, make vertical takeoffs, and stand still in the air while she repairs her makeup. So you stow an overnight case in the helicopter cabin and are off.

"There's a ten buck fine for slipping out of the 2,000-foot lane," you remind her as you indulge in a little backseat flying.

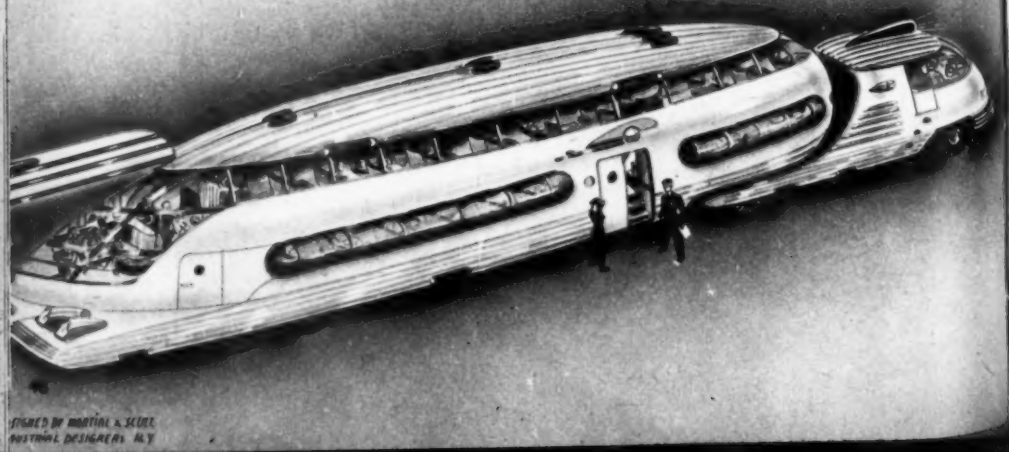
She knows as well as you that there are traffic officers (naturally they're called "helicops") scattered among the private planes that crowd the public flyways. Reckless flying will bring a gruff "pull down to that landing field" order over the radiospeaker on the instrument board. Landing strips are spaced ten miles apart, clearly marked and lighted at night, and your wife is secure in the knowledge that if her motors conks out—something almost unheard of now—she can coast into a field or merely float vertically downward, landing lightly as a feather.

At the Minneapolis field the helicopter is parked near a string of aerial taxis and fly-it-yourself planes. They are waiting to pick up passengers from the transcontinental air-train and are designed for short-hop flights to smaller towns and cities off the main line. In the airport waiting-room you watch your east-bound glider train approaching on a wall-size television screen. Still a hundred miles away—just time enough to buy your ticket and kiss your wife goodbye before you step out into the New York glider.

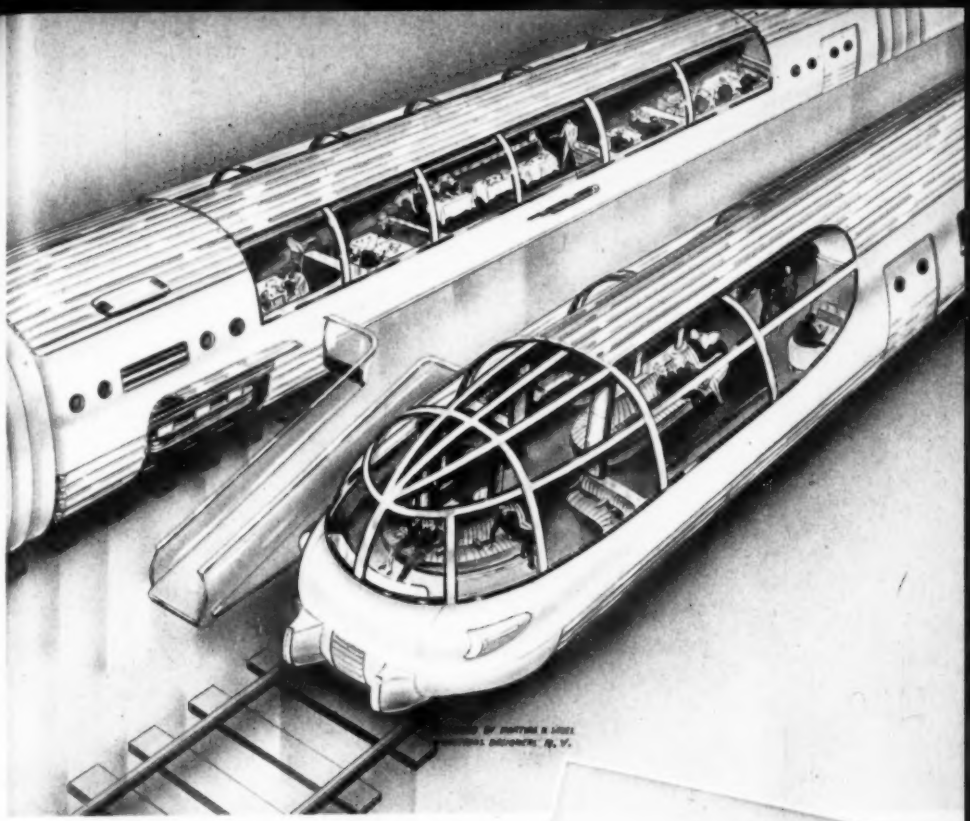
It's parked on the runway, a great beautiful craft with motorless wings supporting a cabin amply large enough to accommodate the sixty-odd passengers already aboard. A cable stretches from its nose and is draped across a pair of upright posts a couple of hundred feet ahead of it.

Improved Coast-to-Coast Transportation
MAKES THE U. S. SMALLER AND SMALLER
In 1856–29 Days.....Rail and Stage
In 1860–18 Days.....Rail and Pony Express
In 1869–7 Days.....First Transcontinental Railway
In 1930–90 Hrs.....By Railroad
1942–16 Hrs.....By United Air Lines

Chart at *left* brings transportation up-to-date. Speed is constantly increasing.



If you travel by bus, this should suit you. Private compartments forward, cocktail lounge in rear, all fully air conditioned.



Sleek diesel trains for rail travelers will provide all the comforts of a fine hotel plus perfect man-made weather; all this, and speed, too. These will whisk you swiftly across the country.

Through a transparent section of the glider roof you see the air train approaching. First comes a stubby locomotive plane, little more than a motor-studded flying wing, pulling glider coaches in its wake like a flight of ducks in V-formation. An end glider with passengers for Minneapolis cuts loose, coasts to a graceful landing at the far edge of the field, while the rest of the train makes its pickup run above you.

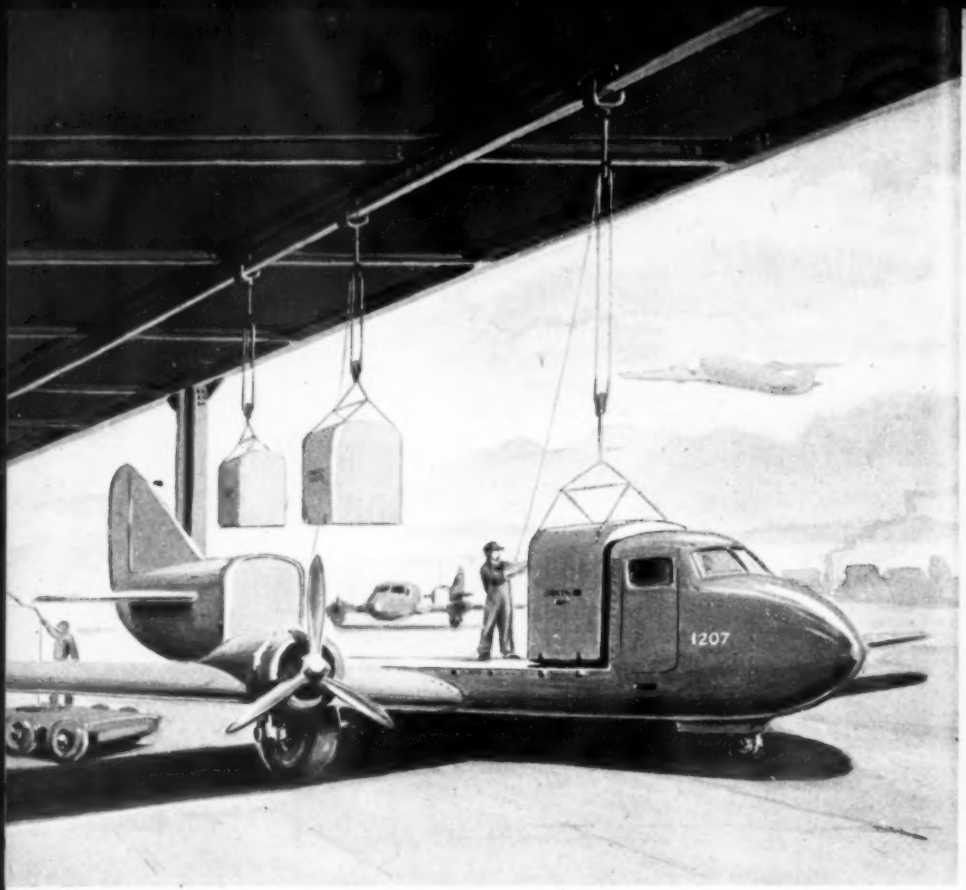
Your pilot converses by radiophone with the locomotive crew. A dragline from the power plane snakes down, engages your cable—the field recedes below you and with less sound than a bird taking wing, you're in the air.

Literally, you ride on clouds. You soar out of range of earthbound noises soon after you hear your wife, far below, shout a reminder to bring home a jar of Stilton cheese from a little store near St. Paul's Cathedral.

Safety you take for granted. In front of the glider pilot and in the locomotive plane far ahead, is a cathode-ray screen that gives a

Tiny Cooper-Bessemer diesel switcher paves the way, out-pulls steamers now used in switching.

running picture of the ground below or obstacles ahead—wherever it is pointed. Infra-red rays formed in a television transmitter are sent directly forward to the instrument-board receiver. Infra-red rays are "invisible light" which penetrates fog or darkness with perfect ease—the basic principle of "nocto-vision" which enables night fighters, secretly equipped, to down enemy raiders. In darkness black as a sealskin coat, and fog thicker than a Russian accent, a daylight-clear picture



Not a wild dream, but a type of sectional freight plane based on a Curtiss-Wright suggestion for future aircraft.

of terrain is always before the pilot's eyes.

Suppose, though, that your locomotive should crash into a mountain. Your coach can cut loose and because of its light wing-loading land at low speed. It has no motors, no gasoline, so there is no fear of fire, the dreadful spectre that accompanies crash landings.

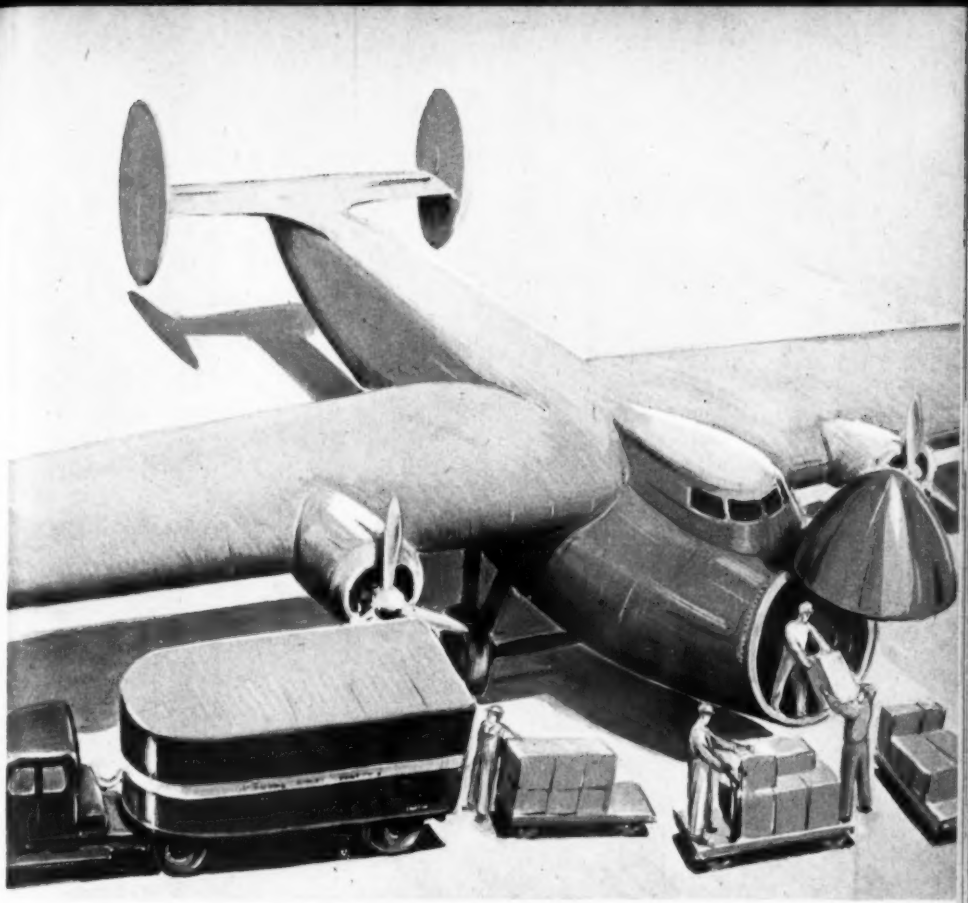
Four hours later you land in New York after a non-stop flight during which you have dropped coaches at Chicago, Cleveland, and Pittsburgh and picked up others with passengers for the East coast. You have hours to spare before the night air express takes off for London.

If all this strikes you as a wild flight of fancy, give ear to what leaders in aviation have to say about it. Casey Jones, President of the Casey Jones School of Aeronautics, speaks for dozens of his fellow authorities when he says:

"We may see long glider trains hooked behind a commercial plane or air express ship, enabling each family to drop off as the air train nears their destination. The new government Glider Pilot Training program will do much to advance this possibility. While in the slightly more expensive classification, light single or twin-engined ships will carry an entire family in greater safety and comfort than we now enjoy in the automobile."

Without much ballyhoo, the government has indeed been training hundreds of glider pilots, to such good effect that at this very moment transport glider trains are carrying men and supplies to American forces. Some day these pilots will take their places in the world we are fighting for. Make no mistake about it, the air-train principle is already here, and here to stay.

The logic of it is irresistible. An air locomotive can pull twice as many passengers in gliders as the same motors could carry in a single ship. Takeoff loads are split into several



Another Curtiss-Wright idea on future aerial freighters is this nose-loaded giant. Crew would ride above cargo hold.

units, making this extra capacity possible, for once a load is in the air it does not require nearly the power needed to get it off the ground. Travel is faster because its nonstop, safer for reasons already mentioned, and quietly comfortable beyond anything you have experienced. All these corner-cuttings reduce the cost of flying, giving the pocketbook appeal which wins the final touch of public approval.

Glider trains do not mean that more conventional airliners will be out of the picture. Many airline executives view such liners as ships of 100-passenger capacity, ready shortly after the war. In the field of transportation as nowhere else there is going to be terrific competition until the "bugs" are shaken out of new developments and each medium finds the niche it is best suited for.

In private air transportation, for instance, the helicopter will fight it out with the foolproof family plane and both of them will compete with the automobile. Igor Sikorsky has definitely proved that the helicopter is feasible. Since man first dreamed of flight the helicopter has been the unattained ideal: a craft that could rise and descend vertically and stand still in the air as if hung from a sky hook. Uncounted hundreds of inventors have lost their fortunes and their hearts trying to perfect one.

All the more exciting, then, to watch Igor Sikorsky demonstrate his helicopter at his big Stratford, Conn., factory. The craft has a light frame fuselage and the motor drives rotating wings mounted above the center of gravity, like a fan on its back. Sikorsky steps into the cockpit, the wings rotate and the craft goes up like an elevator, to stop 100 feet in the air while the pilot lights a cigarette. He brings it down vertically, stops a foot above the ground and leans out to pick up a package. Then he's up again and at 500 feet the motor is cut. The helicopter settles

gently and touches earth like a tired leaf. Not even your Aunt Agatha would scream at the prospect of a dead stick landing.

You see why the helicopter will appeal to a special group of purchasers: it's as easy to run as a sewing machine, can land and be stored in any back yard, takes off vertically from a parking field crowded with cars or other helicopters, enables you to descend on the roof of your own office building, and its rotating wings will lower you more safely than a parachute if the power plant gives out.

"This rotating wing aircraft can rise and descend vertically, move forward, backward, and sideways, and even hover," says Eugene E. Wilson, President of United Aircraft Corporation. "It is possible to construct the helicopter in the form of a light car suitable for travel to and from business. Then, when the distance warrants, you can go up and over by air to your destination!"

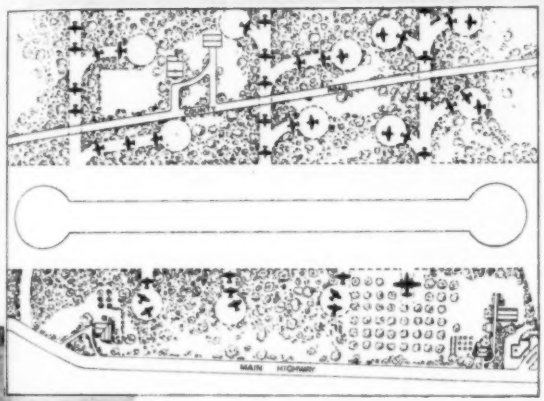
There's a prospect for you! Scoot over the highway in your helicar to sell a prospect a bill of goods, then unfold your wings and fly off to your main office a hundred miles away to be on deck for an 11 a. m. conference.

Another big group of personal flyers will prefer planes which are descendants of some of the light ships developed just before the war. These will be more conventional in appearance, but far from conventional in performance. It can fairly be said that they will take the art out of flying. You won't spend long hours learning how to come out of spins and stalls because the planes won't spin or stall. They will even land crosswind so any narrow strip of land can be used as a field.

Aeronca Aircraft Corporation, a leading producer of light planes, will present new types of personal aircraft after the war.

"Many revolutionary designs have been talked about by aeronautical engineers that would change the entire control system, outward appearance of the ship, and result in sensational performance. Many of these designs have possibilities and we know that some of them will be taken off the drawing boards and perhaps, through experiment and research, a first model will be built," says Walter J. Mitchell of the Aeronca Company. "Rather than permit our imaginations to run wild and perhaps create a type of airplane that is seen in Rube Goldberg cartoons, we are setting our sights on several models that we believe will be particularly adaptable to

Heli-flivvers will whisk the man of the house from home to airport, to catch perhaps the morning plane for London.



Airplane runway strips built along highways for military use will serve peacetime air traffic.

post-war aviation needs. Our primary interest is that any airplane we build be strong, well built, durable, with as much safety built into the ship as we can engineer."

Cessna Aircraft Company has a family plane scheduled for production as soon as victory is won. Says its President, Dwane L. Wallace:

"Its price range will be that of the automobile of today and it will operate far more economically. Safety factors have been developed for our plane of the future far in advance of anything used at present. Learning to fly it will be as simple as learning to drive an automobile."

"Economy" means just that. We already have light planes that deliver 25 miles to the gallon—a gas and oil cost of about $25 for carrying two people across the continent!

But we haven't got you to London yet. After taking in a show at the Music Hall to kill a little time, you go out to the airport and stroll aboard the London liner: It's a 500-tonner, an ocean liner with wings, not vastly different in lines from Clippers you have seen, but monstrous in comparison. How big? Well, the *Mars*, the biggest seaplane yet built, has a 200-foot wingspread, is tall as a house and can carry 150 soldiers with complete equipment. Yet it displaces a mere 70 tons!

This is old stuff to you; so after wandering through the dining salon, playing a rubber of bridge in one of the big card rooms, and looking in on a vaudeville turn in the airliner's theater, you retire to your cabin. It's the size of a hotel room and as you crawl into bed the [*Continued on page* 158]

YOUR DAILY LIFE TOMORROW

Without your realizing it, great changes have already come into your daily life—in the clothes you wear, the food you eat, your methods of keeping healthy. You are beginning to eat vitamin pills, to wear suits made out of redwood trees, to use many substitutes. Have you any idea, though, how really revolutionary are the changes that will be made in your daily life by the time the war is ended? Read next month's MI: "YOUR DAILY LIFE TOMORROW."

DRUM TALK

THE SECRET OF JUNGLE TELEGRAPH EXPLAINED FOR THE FIRST TIME

by A. I. Good

Courtesy of Natural History, *Official Magazine of the American Museum of Natural History*

LISTEN to that drum beating in a town a mile away. "Tap-tap-tap-tapping, tap-tapping-tapping-tap!" How clearly the beats sound out over the forest. How exactly the call is repeated, its tempo the same every time, every pause in precisely the same place. But wait, it changes, and now goes "Tap-tap-tap, tapping!"

You ask your native companion, "What is that drum saying?".

He looks sheepish, but answers, "Man call chief come quick, say white man come." It is all mystery to you: but 20 minutes later, when you arrive in the town, the chief is there waiting with a present of two eggs for the white man. You decide there is something to this drum business.

Could you hear and interpret those beats of the drum as can your black companion, you would know that the first series was the in-

The jungle drums talk in strange, stylized code phrases. Each of the code phrases quoted below is the "drum name" of some African native.

EVEN IF YOU DRESS FINELY, LOVE IS THE ONLY THING
DON'T GO WHERE THE LUCKY FELLOWS ARE TAKING WOMEN ALONG LEST YOU GET INTO TROUBLE
YOU'LL DIE OF WITCHCRAFT AT MIDNIGHT
A RICH MAN PUTS ON AIRS IN HIS OWN VILLAGE

dividual drum-name of the chief, rendered as follows in the Bulu language of South Cameroun: *"Kup te mfañ étom, be limeti kupe tyiñ."* This was repeated several times to get his attention. Then followed the phrase, also repeated, *"A wôé bôt élañ,"* the general drum-name for a white man, and not very complimentary. Then the words *"Za' avô, za' avô,"* meaning "come quickly, come quickly." The chief, off in his garden, understood that he was being called because a white man was coming. So he returned at once and played safe by getting ready a small present.

Long before white men came to Africa—how long ago no one knows—the black man had developed his own peculiar system of wireless communication.

He needed it, for in the heart of the tropics the country is one vast unbroken forest. Roads were non-existent, only footpaths traversed the jungle. Men went far into the forest to hunt. Women traveled long distances to their garden-clearings. If something happened in town, how could they be informed? An important man died, his funeral was a major event in the primitive community; how was word to be spread? A man's wife ran away; how could he tell the people along her path to catch and hold her?

The jungle drum, though hollowed from a single log, emits two different tones. The two wood blocks in center are called "The Man" and "The Woman."

Once a native chief gets a really good drum, it lasts him for years. This "crier," though nearly worn out, still retains its two distinctive tones.

Sickness, death, war, hunting, fishing, all are of prime importance to the savage. The practical answer to all these needs is the drum. In many parts of West Africa these wooden drums are also known as "gongs." Messages beaten on the drum could call individuals miles away in the forest or broadcast news to distant villages. By relaying it from town to town a large area could soon be apprised of news vital to all. Though the white man has in recent years perfected his wireless to cover thousands of miles, remember that the primitive African savage invented his "wireless" long before a European ever thought of it.

An ordinary drum can be heard easily in the daytime at three or four miles. In the dead of night the best drums carry ten or even fifteen miles out over the forest. I knew of one exceptional drum that has been heard 25 miles, though its message could no longer be understood. Three factors, in the main, determine the range: the size of the drum, its individual quality, and the type of country.

Medium-sized drums carry farther than the very small or the exceptionally large. In-

dividual instruments differ widely in resonance, because of the kind of wood used, or even more as a result of construction. A good drum-maker becomes widely known. In certain sections the topography is of importance, long valleys or river courses aiding transmission in their direction. The range of any given drum therefore varies greatly.

The Bulu, together with the Yaoundé, Bene, Ntum, Okak, and some other peoples, are all part of the great Fang tribe which extends clear to the Ogowé River in French Gabun. While each of the lesser groups has developed dialectic differences, the whole Fang language is basically one. Any one of the dialects would be understood wherever Fang is spoken. Fang belongs in turn to that great language family known as Bantu, which extends all across equatorial Africa, and south nearly to the Cape.

It is true that the drums vary in form over the vast expanse of Africa in which they are used to send messages. Certainly also the drum-calls differ between distinct languages, for phrases from the language in use are beaten on the drum. We venture to assert, however, that the basis of message transmission by drum is the same wherever the system is used. In this article we shall confine ourselves to the drums and drum-calls of the Bulu people, with which we are familiar.

The call-drum is a hollowed log of wood. Some three kinds of hard-wood trees are used by the Bulu for making it. The *mbel* tree, or bar-wood (*Pterocarpus osun*, of the family Leguminosae), is often employed, as is also the *ebae* (probably *Pentaclethra macrophylla*, of the family Mimosaceae). The latter is acacia-like, bearing large pods. Another hardwood tree with thorny bark, the *olom* or *ololom*, is equally good.

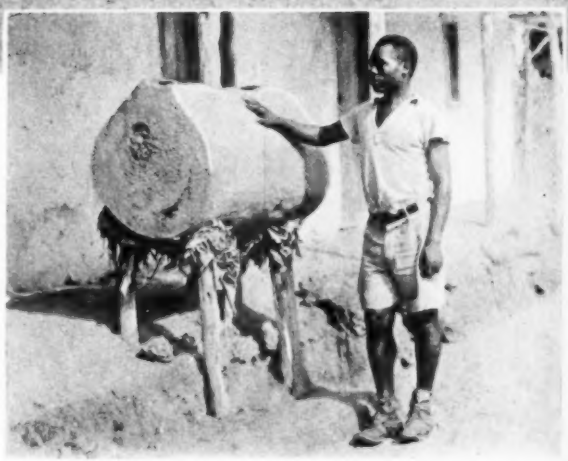
Four villagers before their talking drum. The name of man at right is: "Don't Go Where Lucky Fellows Are Taking Women Lest You Get In Trouble."

A small drum will require perhaps a two-foot section of log, while a large one may reach a length of three and a half or four feet. The log is hollowed out roughly through a longitudinal slit while still lying in the forest. The slit is three or four inches across, and runs nearly the whole length of the log. After its weight has thus been reduced, the log is slung on a pole, brought into the village, and the finishing touches are then added. The sides are carefully hollowed to the required thinness and smoothed off, by the use of a chisel-like tool inserted always through the same slit. The curved walls of the finished drum will be but a half-inch or less in thickness, the ends being left two or three inches thick. This makes a hollow cylinder with closed ends, highly resonant when dry, the only opening being the slit along the top.

When the slit is first made, a small section of wood is left connecting its opposite edges, a little to the left of the exact middle. This is known in the Bulu tongue as the *otat*, or crier. Later the small section is separated into two blocks of different size, each adhering to its side of the slit, separated from the other by a crack one-quarter inch wide. One, known as the "man," is nearly twice as broad as its mate, called the "woman."

When I inquired why these blocks are situated to the left of the middle, the answers, though indefinite, were to the effect that if they were right in the center the tones would be somewhat jumbled, or muffled. If slightly off-center, the tones of the drum would be clear. Possibly it is a matter of overtones, not understood but learned by experience.

Characteristic village in the Cameroun jungle of Africa. At *left*, a drying rack for cocoa.



Dried banana leaves serve as a buffer between this drum and its mounting, so that it won't lose its resonance. Drum talk experts are growing scarce.

There are two drumsticks about a foot long, one for each hand. The best are sections of the midrib of the frond of a palm, *Raphia vinifera*, the flatter lower side being struck against the drum. Rounded sticks may also be made from the soft, light wood of the common umbrella tree, *Musanga Smithii*, called by the Bulu *aseng*. They may be of equally soft white wood, from the *avom* vine or tree, a member of the family Anonaceae, probably *Cleistopholis Staudtii*. Harder woods wear away the lip of the drum too quickly. It is beaten on the edges of the slit, just on each side of the "man" and "woman" blocks, the drummer standing on the "woman" side.

To secure the best resonance and carrying power, the drum should be supported on ropes roughly woven from the outer fibers of plantain or banana plants, or from the dried fronds of the same plants, upheld by a frame of forked sticks driven into the ground. A small thatched roof may be built over it for protection from sun and rain, and a piece of bark laid over the slit. The drumsticks are usually kept in the cavity of the drum. At the close of a drum-call the thump of the sticks as they are dropped in is characteristic. For a small drum the special support is not worthwhile. It is kept in the palaver house of the chief, to be carried out and laid on the ground as needed.

The basis of message transmission is tone. Many of the Bantu languages are "tonal" in character. To be properly spoken, they require that each word be pronounced in its correct tone. There are five different tones in the Bulu language, but most words are either in the two [*Continued on page* 162]

WIN AN AERONCA
SCORES OF

MECHANIX ILLUSTRATED is going to give away *absolutely free* a grand Aeronca airplane in the $1,700 trainer class (or $1,500 in War Bonds) to one of its lucky readers! It might as well be YOU! In addition, there will be nearly *one hundred* other of the swellest prizes you ever set your eyes on. Just a few of them are listed on these pages.

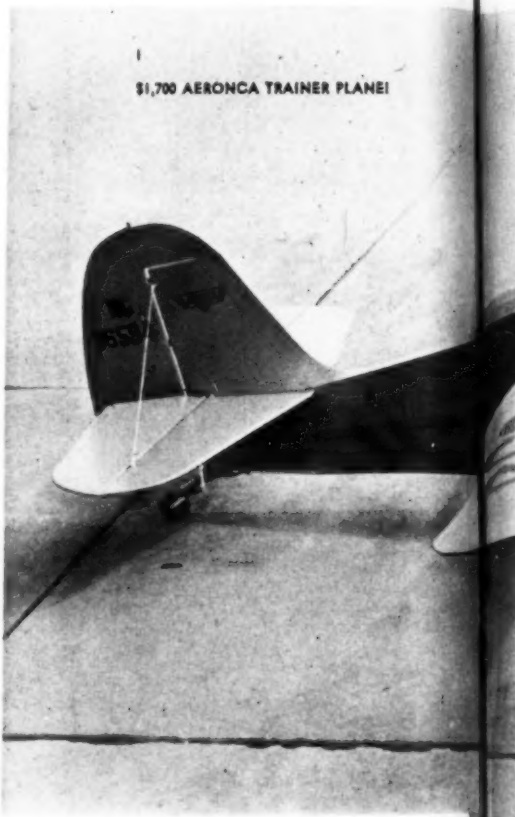
Here's how you win:

You all know that MI is famous for its "word game" contests—contests so fair that *everyone* has an equal chance of winning, so thrilling that they are more fun to play than a crossword puzzle. For two years now, MI has run big "word game" contests that have been miracles of the publishing world. This year we have a brand new one—more thrilling and *easier* than ever! It's "BUILDWORDS."

"BUILDWORDS" is a game of fun and pure skill. There are no slogans to write and no catches.

The big "BUILDWORDS" contest will open in the February issue of MECHANIX ILLUSTRATED. Order your February MI NOW—TODAY from your local newsstand!

Remember: The big, new MECHANIX ILLUSTRATED "BUILDWORDS" Contest, with an Aeronca airplane and scores of other prizes, starts NEXT MONTH, in the great, new FEBRUARY MECHANIX ILLUSTRATED!



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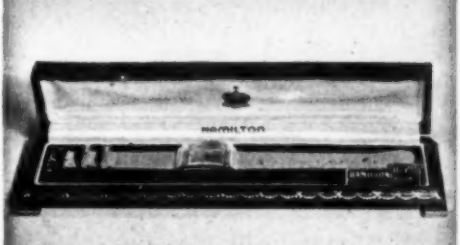

AIRPLANE
OTHER PRIZES
FREE!

$1,500.00 IN WAR BONDS!

As an alternative to the Aeronca trainer class airplane offered as first prize, in case circumstances make delivery of the plane infeasible, there will be a prize of $1,500 in U. S. War Bonds!

There will be almost 100 other prizes in addition to that grand Aeronca plane and the other prizes pictured on these pages. Here is just a partial list of some of the other swell merchandise awards which you can win:

Whizzer Bicycle Motor
Atlas Drill Press
ZEPHYRPLANE JR. Belt Sander
Delta Scroll Saw
Power King Woodworking Lathe
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Pflueger "Supreme" Fishing Reel
Ultra DeLuxe HANDEE Grinder
Flexible Flyer Splitkein Skis
The New Merriam Webster Dictionary 2nd Edition
Bausch & Lomb Microscope
Kalart Master Automatic Speed Flash
Samsonite Two-Suiter Bag
Smith ArcticAire Fan
SheaRer "Triumph" Tuckaway Ensemble
Iver Johnson Matted Top Rib Gun
Microdyne Atom Engine
Radiant Automatic DeLuxe Model D Screen
Graphomat Multi-Lens Photo Enlarger
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Miles Kimball DeLuxe Bridge Chest
Set of Weed Tire Chains
Ranson Table Lighter
GHQ Model Engine
Daisy Defender Air Rifle
New Departure Two-Speed Conversion Unit
Dremel Moto-Saw
Fee & Stemwedel Remote Reading Thermometer
Boyce-Moiser Sextant
Delta POWERlite
Electric Arc Welder
"Yankee-Handyman" Spiral Screw Driver
Eberhard Faber Permapoint Pen and Pencil Set
Ideal Model Airplane Construction Set
25 copies of "Fun for Boys" from Knickerbocker Publishing Co.
One pound of Cascamite Resin Glue and One Pound Can of Casco Powdered Casein Glue
Scientific Model Airplane Kit
G-H Specialty Woodenware

1

2

3

The *Darndest* Things Help Build a Plane

LARGEST user of baby bottle nipples today is, if you wondered, the makers of Wright engines for warplanes! Nipples are slipped over small openings (photo 1) to prevent foreign objects falling into the engine during manufacture. And at Vega Aircraft walnut shells (photo 2) once discarded are ground into flour as a filler for plastic dies and drill jigs. Photo 3: Engineers working in test cells plug their ears with erasers, the kind that slip over pencil ends, to shut out the roar of test-running engines. Photo 4: Koroseal shower curtaining around magnetos protects them during engine cleaning. Photo 5: Old phone book pages over openings in foundry moulds keep out dirt. Heat of molten metal burns the thin paper away without residue.

4

5

RED GIANTS AND WHITE DWARFS

by Willy Ley

How does the sun burn? What was the Star of Bethlehem? Here is new light.

THE first event in Christian history was an event in astronomy. The birth of the Christ was marked by the appearance of an exceedingly brilliant star in the Heavens. It was the Star of Bethlehem, the star that guided the Wise Men to the Manger in which the Infant Jesus was born.

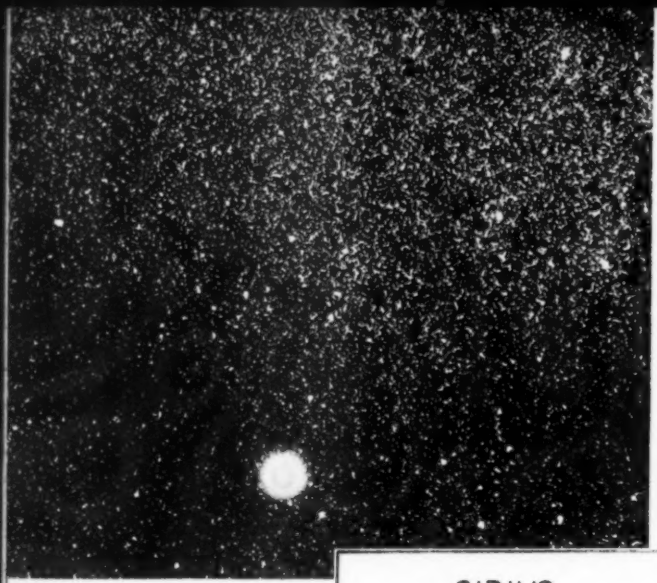
There can be no doubt but that such a brilliant star appeared. Many documents, even aside from those of Christian origin, record the fact.

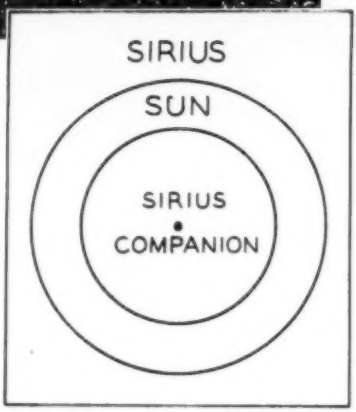
But what *was* the Star of Bethlehem—the star whose replica we hang atop our Christmas tree each year at this time?

For centuries, scientists have been searching for the answer to that question; for the same question involves the most important single question in our daily life: What is the sun? What makes it burn?

In the course of their search for the answer to these questions, they found many strange things about the Heavens—strangest of all the fact that it is peopled with red giants and white dwarfs.

When Tycho Brahe, the famous Danish astronomer of the sixteenth century, was at the height of his glory, the heavens presented him with a spectacle very similar to the Star of Bethlehem. It was in November, 1572, and Tycho Brahe





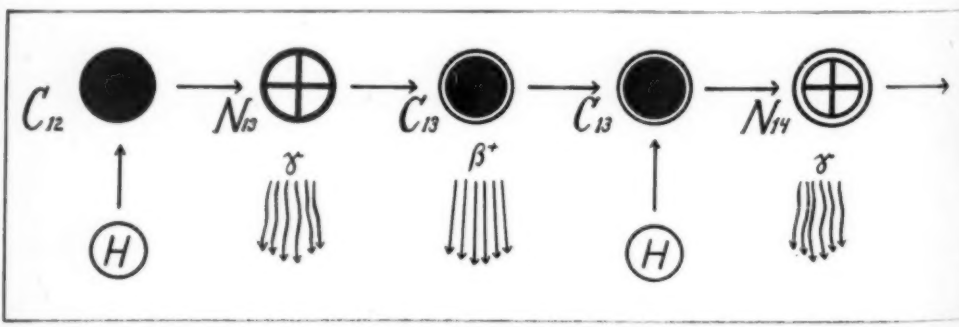
Above: The flare of a "nova." At *right:* Diagram shows comparative size of star Sirius, our Sun, and Sirius' companion star, a white dwarf" weighing as much as the Sun.

had just begun his routine work, when a star blazed forth with unheard of brilliance in the constellation known to astronomers as Cassiopeia. It was not a star with which the famous astronomer was familiar, in fact he would have sworn that no star at all had been in that spot in the skies the night before.

Tycho Brahe's face is said to have been oddly immovable because of the piece of hammered sheet silver that served as part of his nasal bone—the original bone having been smashed in a very common brawl when he was young—but it may have shown emotions then. At first the severely dressed dignified nobleman simply doubted the testimony of his remarkably sharp eyes. Then it occurred to him that the star might disappear as suddenly as it had come. Wielding a large and massive sextant—Tycho was always proud of his strength—he established the correct position of the new star in feverish haste. The telescope had not yet been invented then, but there was no need for one, *Tycho's Star*, as it came to be called, shone so brightly that it could even be seen during the day. Then it faded away.

Thirty-two years later the spectacle repeated itself and again there was a famous astronomer on hand to observe and to record his observations: Johannes Kepler. Since then no astronomer on earth has witnessed precisely the same event, but otherwise astronomy progressed mightily during the three and three quarter centuries since Tycho's Star.

Tycho had not even tried to find an explanation for the miracle, as he termed it. It was a miracle, that was explanation enough. Besides the great astronomer did not know what the stars really are. Neither did Kepler, even though it was Kepler who found the laws of the motion of the planets, something Tycho had vainly strived to accomplish until he finally called Kepler



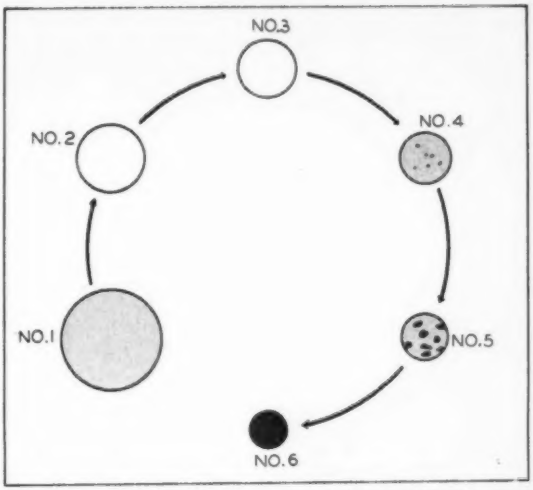
to his aid to do it for him. Kepler, near-sighted and often sickly, was not as good an observer as Tycho, but he was a master of mathematical operations. And through his devotion to mathematical logic he knew that future astronomers would know more than he did. He left the explanation of the phenomenon to them . . .

But though his trust in the future was fully justified, Kepler's successors learned everything else first . . . and they are not even now *quite* sure just what causes the phenomenon of *Tycho's Star*.

First—it is necessary to skim rapidly through the following three centuries of astronomical history—they had to learn what stars are. It was comparatively easy. Not counting the planets, the "wanderers," all stars were essentially the same as the Sun. They were gigantic spherical blobs of superheated substance, emitting light and heat at an appalling rate all the time. The Sun happened to be very close—a mere 93 million miles as they soon found out. The other suns were billions upon countless billions of miles removed. That made them appear as luminous pinpoints.

After that they had to learn that the stars are not strewn through the universe in a haphazard manner but that they were arranged in definite "island universes," or galaxies. The Milky Way, they had to learn, was the rim of the galaxy we happen to be in, the so-called Great Nebula in Andromeda was another galaxy . . . and there were many others, each composed of from 20 to 40 billion suns or stars.

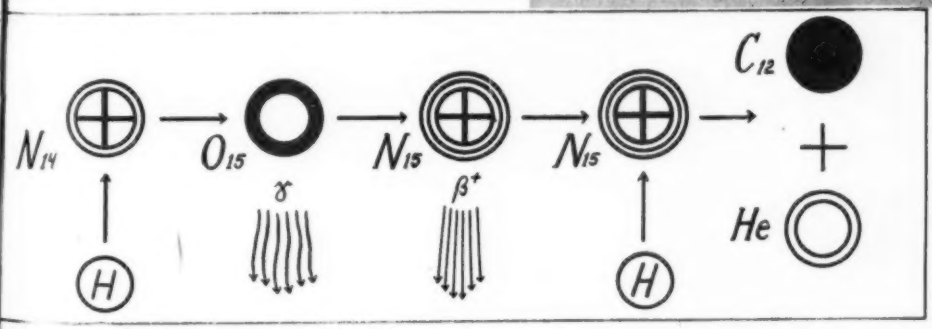
But before they had truly conceived this picture—the real trouble with stars and stellar astronomy is that everything exists and happens on so gigantic a scale that the mind needs a long time to get used to thoughts of such magnitudes—they had begun to wonder about the stars of our own galaxy. Some were bright and luminous, like Sirius, the dog star, others were faint and looked reddish. Somehow they gave the impression of being nearer or farther away, but there was no way of

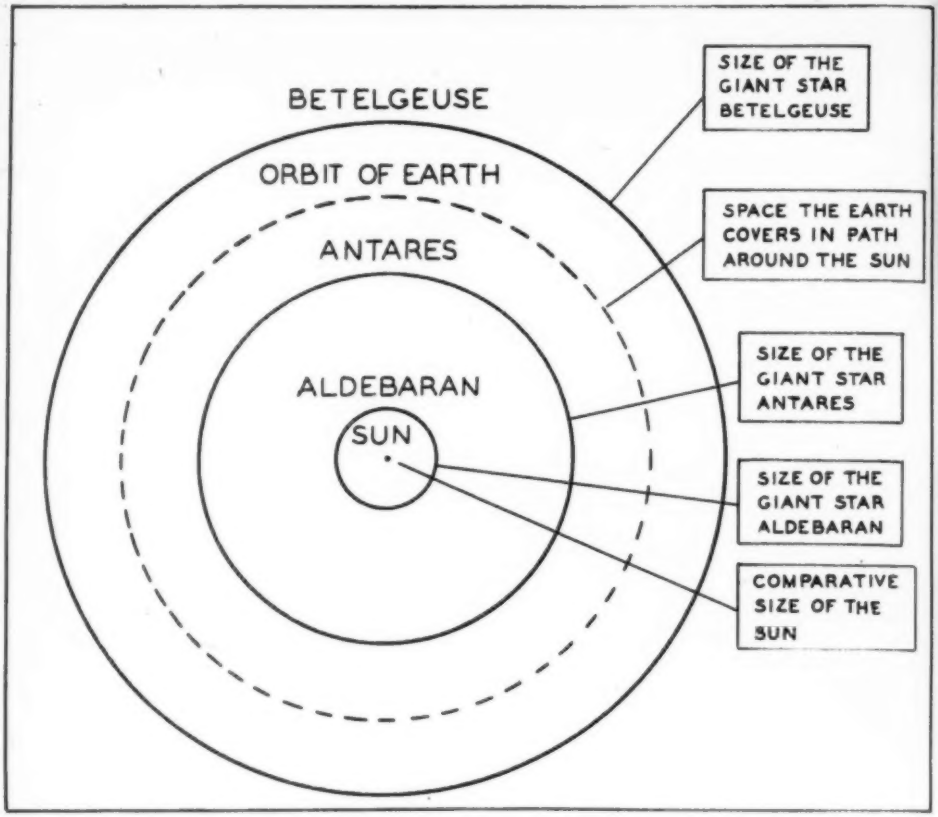


Until recent discoveries, scientists believed that the Heaven's dwarf white stars were caused by the loss of radiation as a giant red star contracted and grew denser. The old conception of what happened is shown in the diagram above. Giant red star (1) contracted and grew to white heat (2); it cooled gradually to become a yellow star (3) with spots (4) which became larger as the star grew older (5), until finally the star became cold and invisible (6). The text explains new theory.

HOW OUR SUN SHINES

Here, across the bottom of two pages, is the chemical formula of what happens inside the sun to give us sunshine. In simple language, what happens is this: A carbon atom unites with a hydrogen atom to start the reaction. This forms a nitrogen atom and releases radiation. In following steps, nitrogen breaks down, four hydrogen atoms are destroyed and sunshine results.





This diagram will give you an idea of how gigantic are the "red giant" stars in our heaven. The earth's path around the sun is 186 million miles, but the star Betelgeuse is even bigger.

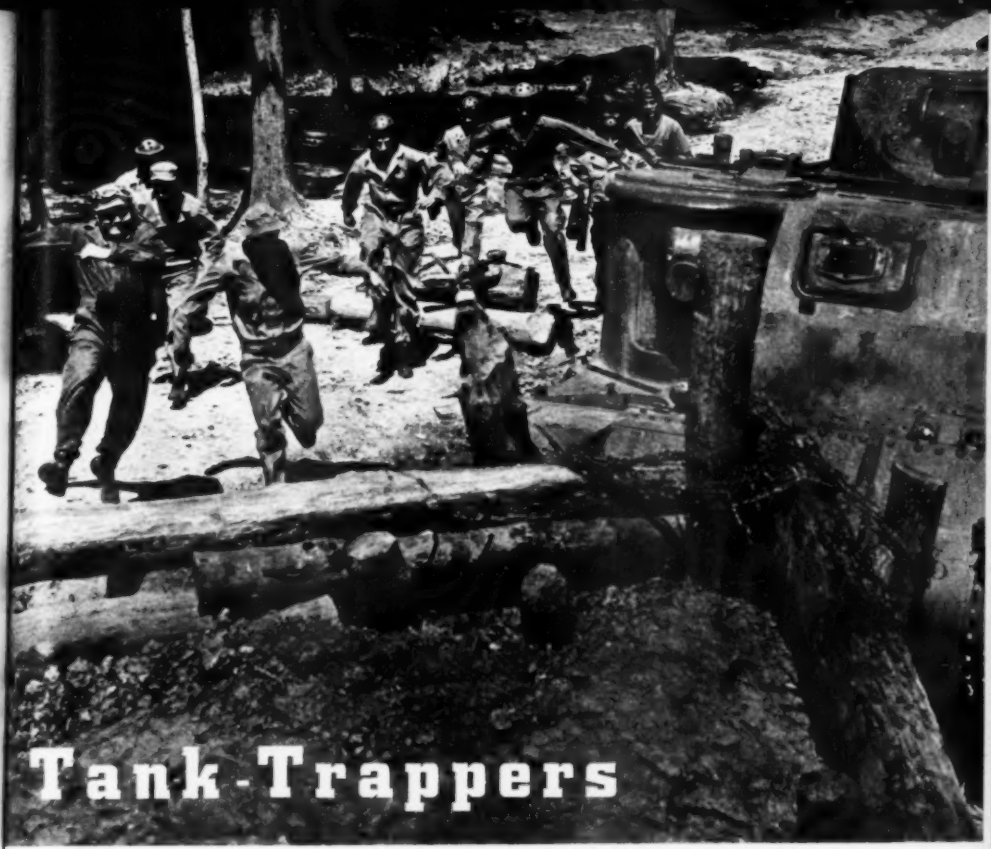
measuring the distance or even guessing it from the apparent size, because each and every star showed the same diameter no matter how powerful the telescope: the diameter was in each and every instance zero. All stars were pinpoints of light in every telescope—and even the 200-inch giant on Mt. Palomar is not going to change that. Astronomers had to learn how to measure the distances of the stars and how to determine their true sizes.

It would need a book to tell how they did it, but the fact is that they succeeded. And they learned, almost incidentally, that our own Sun was a nice average star, medium-sized, of medium density, medium-luminous, medium-hot and middle-aged.

There were many other stars like that in our galaxy, but there were also many exceptions. There were stars whiter and evidently hotter than our Sun, Sirius for example, and there were stars that were faint and reddish and somewhat decrepit looking. There were others that were also reddish, but apparently of much larger size than our Sun.

Meanwhile astronomers had found themselves troubled by a more specific problem, by a problem connected with the nearest star, the Sun. That star, and all the others too, radiated tremendous quantities of energy into empty space second for second, minute for minute, hour for hour, twenty-four hours a day year in and year out for century after century. Where did these incredible amounts of energy come from? How did the Sun keep going? And for how long could it continue to waste heat and light?

Some had thought of the energy of meteorites falling into the Sun. This thought was correct, no doubt, but could the meteors account for the energy-expense of the Sun? A well-spent half [*Continued on page* 168]



Tank-Trappers

by A. Eriss

YAY! The tank trappers have caught another "sardine can" in one of their obstacles at Ft. Belvoir, *above*. This event is cause for great rejoicing.

Meet the Pioneers, who trap the biggest game in the world—and their tough foes, the trap-busters, who brave death daily to help perfect America's system of tank defense.

"TIME UP" shouts the lieutenant. His pioneer platoon, at the Engineers' Replacement Training Center of Fort Belvoir, Va., busier than the proverbial beavers for the past 90 minutes, finishes work on a weird-looking maze of massive wooden logs in a final flurry of sledge-hammer blows. Lugging their axes, mauls, saws, they scamper to the safety of a nearby glen.

About 150 yards away, a thirty-ton tank coughs, louder and louder—its powerful engine finally roaring like all the thunder in the world. As it gains momentum, the driver shifting into second, third, fourth gear, it hurtles at its top speed of thirty-odd miles per hour toward low-built, well-braced hurdles in what has all the earmarks of a suicide attempt. The 60,000-pound monster straddles the hurdles, its nose pointed skyward. It dives forward, the treads seem to sink in the earth, the tank rights itself, with its momentum sharply reduced.

With even more reckless daring, the tank lurches for the forbidding-looking trap. Pillars of wood, four feet of their length buried in the ground, support massive, long logs, at their far ends, six feet off the earth. Bound with barbed wire at critical points, the sawhorse ramp bids fair to gouge out the vitals of the tank. The pioneer-spectators gasp in anticipation as the land battleship hurls itself on the trap. Inside, Sgt. Jim Hayden, the driver, sees, in sickening succession, through his vision slit, first a bit of sky, a snatch of earth. The roar of his engines deafens him, he falls back as his tank rears up, only his helmet saving him from a fractured skull. The tank, its engine screaming in terror,

Tank-trappers cut their own logs on the scene to build obstacles. They build one of these in a few minutes.

careens crazily from side to side. In desperation, he jams the accelerator to the floor and ducks instantly, as a death-dealing log staves in his door plates. Up still higher, a sickening lunge sideways—the tank pitifully claws the air with its tracks, hopelessly impaled, an easy target for anti-tank guns.

Outside, bedlam breaks loose as the engineers leap into the air, slap each other's backs, gloating over their handiwork. But, from a few yards away, run several tank drivers, fear for their sergeant uppermost in their minds, dashing for the tank. Swarming over it, they unbutton it, glance inside. One of the tankmen jumps inside, and helping hands bring the unconscious form of the driver up. A superficial check fails to disclose any bleeding wound, a bucket is brought, Hayden is doused—in a few seconds, his eyelids flutter, he stares, then "Hey, I don't know how that could've happened. Lemme try it again."

Hayden will come back for more, even though he saw his buddy from Fort Knox break his back a short while ago in a similar test. They always come back for more, these dozen tank-trap-busters at Fort Belvoir's Replacement Center. Each test entails the risk of crippling injuries or—death. But that doesn't stop 'em. Their daring shocks even battle-seasoned veterans. The lad who broke his back some months ago pleaded for another test the very same day, ignorant of the extent of his injury until the next morning. Private Raleigh Boaze distinguished himself not long ago by getting himself knocked out cold before Field Marshal Sir John Dill, visiting Belvoir. For days later, every officer passing by the obstacle area made solicitous inquiries about Boaze's head.

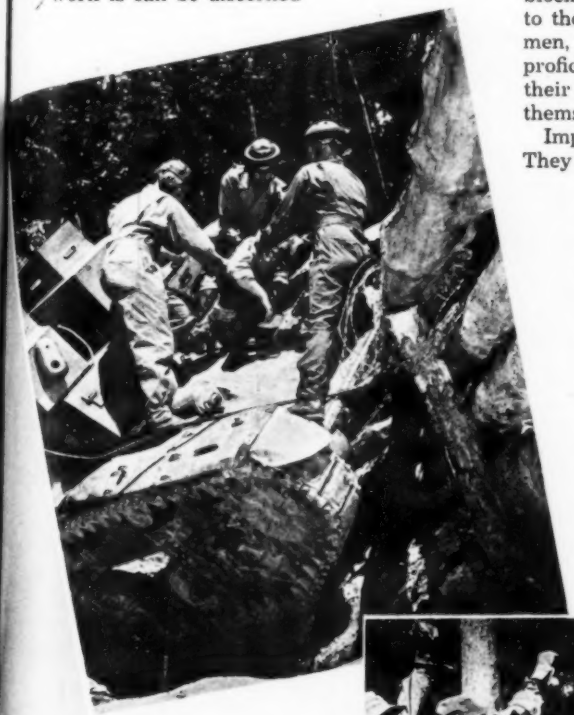
What Sir John saw was the rule and not the exception. Ribs, chins, heads are frequently banged up—the daredevils (only "dog-faces" to the pioneers constructing the traps) use only a safety belt, scorn other "sissy" frills.

The trap built, a "tin sardine" tries it out. Here it comes, at full speed!

Barriano, Boaze, Brownrigg, Deery, Hayden, Lamoreaux and Rosenfield are pioneering, with their buddies, on a new path—which will mean, sooner or later, countless enemy tanks impaled or slowed down, at the mercy of American anti-tank squads. One amazing feature of their work is that only three are graduates of tank schools, the majority being, only recently, raw recruits who answered a call for volunteers, and who were selected from hundreds at Fort Belvoir. They volun-

teered to risk their lives—without any extra pay—in a "hot sardine can," pushing it into ditches and at log barriers. Trained at the Engineers' Center, these novices know little of tank tactics, formations, firing—but they've got guts and they can drive 60,000 pounds of steel at thirty-five miles an hour into a trap that makes the Grim Reaper lick his chops with approval.

How important their work is can be discerned from the fact that, in as many as 8 tests a day, the trap-busters are often stopped exactly 8 times. Yet, when this work was started 15 months ago, the obstacles built by the raw pioneer platoons were so inefficient as to fail dismally to stop the tanks. For the first three months, the platoons built their obstacles without any tanks to test them—they welcomed the arrival of the "tin cans" and the injection of the competitive motif with savage joy. Their officers wisely conduct the work along sporting lines—the pioneers are given time periods, usually 90 minutes, to complete an obstacle—the addition of this time factor adding an important thrill to their labors. Captain Charles R. Daman, in charge of the obstacle area, feels it's a most realistic note, too, as "on a foreign front they may have just a few minutes to block a road against enemy tanks charging to the attack." Challenged to beat the tank men, they delight in their steadily-improving proficiency, raucously jeer the drivers when their tank loses, turn glum when they lose, themselves.



BANG! Irresistible force hits immovable object—and stops, with tank-buster KOed.

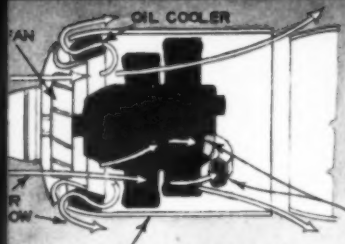
Important lessons have been learned here. They have learned, for instance, that a large, dynamite-blown crater will not, inevitably, stop a tank. If the tank has sufficient momentum, it can overcome the ditch. This discovery was a surprise to the engineers—but "our most versatile troops" got around that puzzler soon enough. By building hurdles before the ditch, the momentum of the tank is slackened, it dives into the crater, partly out of control and thus becomes an easier target.

Among other things, they soon learned that the higher the hurdle, the more effective, and that the deeper in the earth the logs were imbedded, the better the obstacle.

[*Continued on page* 172]

WHEE! The crew of tank-trappers yell their approval of their accomplishment. Great rivalry exists between the trappers and the busters.

The Focke-Wulf F. W. 190



EXCEPTIONALLY CLOSE ENGINE COWLING NECESSITATES USE OF LARGE FAN TO AID COOLING. A REVERSED AIR FLOW PROVIDES HIGHLY EFFECTIVE OIL COOLING

SUPERCHARGER AIR INTAKES

14 MM. ARMOR PLATE BEHIND PILOT'S HEADREST — 8 MM. ARMORED BULKHEAD BEHIND SEAT

2¼" BULLET PROOF GLASS

2 RHEINMETALL-BORSIG 7.92 MM. .314 IN. MACHINE GUNS FIRING THRU PROPELLER DISC (600 ROUNDS PER MIN.)

B.M.W. 801-D 14-CYLINDER TWIN-ROW RADIAL AIR-COOLED ENGINE DEVELOPS 1,760 H.P. AT 18 000 FT.

5 MM. AND 3 MM. ARMOR PLATE NOSE RINGS PROTECT ENGINE

OIL COOLING AIR VENTS

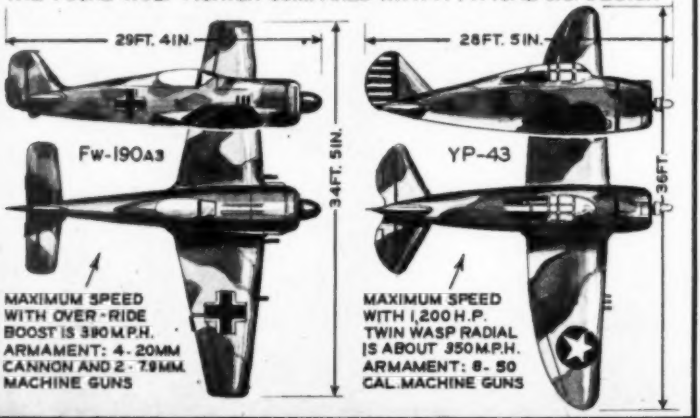
20 MM. OERLIKON CANNON (450 ROUNDS PER MIN.)

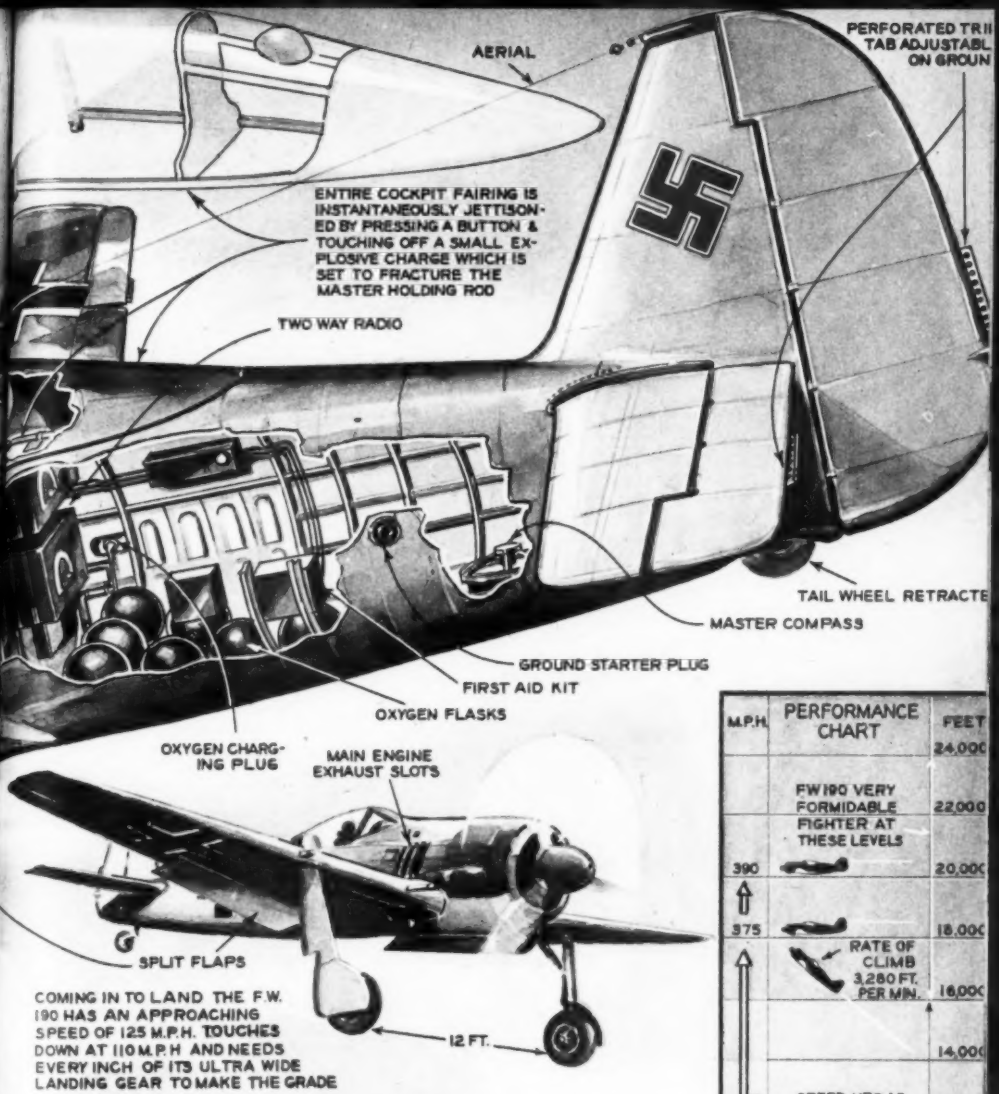
BATTERIES

FUEL TANKS

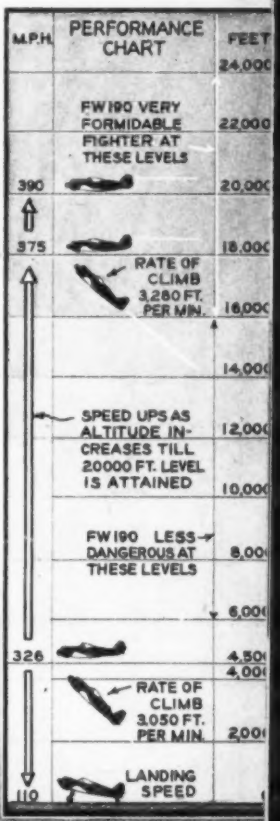
20 MM. MAUSER CANNON FIRES THRU PROPELLER DISC (700 ROUNDS PER MIN.)

THE FOCKE-WULF FIGHTER COMPARED WITH A TYPICAL U.S. DESIGN


29FT. 4IN.
Fw-190A3
34FT. 5IN.
MAXIMUM SPEED WITH OVER-RIDE BOOST IS 380 M.P.H. ARMAMENT: 4-20MM CANNON AND 2-7.9MM. MACHINE GUNS
28FT. 5IN.
YP-43
36FT.
MAXIMUM SPEED WITH 1,200 H.P. TWIN WASP RADIAL IS ABOUT 350 M.P.H. ARMAMENT: 8-50 CAL. MACHINE GUNS



COMING IN TO LAND THE F.W. 190 HAS AN APPROACHING SPEED OF 125 M.P.H. TOUCHES DOWN AT 110 M.P.H AND NEEDS EVERY INCH OF ITS ULTRA WIDE LANDING GEAR TO MAKE THE GRADE



THE 1,760 h.p. Focke-Wulf F.W. 190 is a formidable fighter only at altitudes between 16,000 and 24,000 feet. Unlike many Messerschmitts, it has self-sealing fuel tanks and pilot armor. It is armed with 4 cannon and 2 machine guns. The outer wing cannon are Oërlikons, which have relatively poor hitting power, however. The other guns are synchronized to fire through the prop. An electric retractable landing gear like that of our Mustangs, eliminates the old habit of German planes of "dropping a leg" when the hydraulic landing gear line was hit. Top speed is 390. American Flying Fortresses have shot down F.W. 190's.

CAN YOU BE A PILOT?

by Roy Lester

PERHAPS you never thought seriously of becoming a plane pilot. (If so, you're a rare American!) Certainly you've wondered how you'd make out in the tough physical tests given candidates for the U. S. Army and Navy Air Corps. On these four pages are adaptations which you can try at home, to learn approximately how you stack up with pilots flying the war lanes—and have a lot of fun besides. If you're a male high school graduate between 18 and 26 and pass these tests you probably would be a good aviation cadet.

(Left) Eye accommodation test: have a friend move a type-printed card along a measuring scale which you hold to each eye in turn.

(Below) Blindfolded, a stand as shown fingertips touching someone else's. Raise your arm straight overhead, then bring it down, trying to touch fingers again.

If you can touch the other's finger after three tries, your sense of motion is all right.

(Above) **Balance test: stand blindfolded on one foot 15 secs. Good balance warns pilots of sloppy flying.**

(Below) **Speed-of-reaction test: have a small ball dropped without warning toward your lap from a point outside your line of vision, which should be kept level. Try to catch ball as soon as you see it.**

(Top) **Relaxation test: teaches you to overcome tenseness. Eyes closed, fall loosely and easily three times without hesitation. You should recover normal pulse in 35 secs.**

How are your lungs? An air cadet must be able to hold his breath for at least 40 seconds. Most who qualify reach 60.

And your nerves? Place a clothes-pin upright on the far end of a ruler and with arm extended hold steadily for one minute.

Of course, your sense of motion must be good. Test yourself by trying to walk blindfolded 30 feet forward in a straight

line chalked on the floor. If you vary more than three feet from the line, your apparatus for sensing motion is imperfect.

What about your spatial judgment? Can you bring your forefingers together to meet, tip to tip? Clap hands on your knees, bring them shoulder-high, then together while sighting with one eye. Use a 1-2-3 count two seconds long.

(Above, right) This is child's play! Put a cat cut-out on the wall, then try to pin on its tail while blindfolded. Do it in three attempts and your sense of direction is all right.

This is a Small Boat

Thousands of strange new craft constitute our newest and mightiest weapon against the Axis.

OBSCURED by the fanfare of publicity given airplanes and tanks, one of the most interesting news stories of this war is the emergence of small boats as one of our mightiest weapons.

The PT's have had their share of the headlines, it is true. But the PT is only one of scores of weird and strange types of small craft spawned by the requirements of new naval and army techniques.

The U. S. is in the process of building and assembling a fleet of small combat boats which will number, as nearly as anyone can estimate, in the neighborhood of 150,000! You must remember that figure can be nothing more than a rough estimate because of the secrecy surrounding Army and Navy plans and also because the small boat program is expanding too rapidly for accurate count. But any expert can tell you that the real figure will be a staggering one. However, the interest of the story is not so much in totals as in the hybrid and bizarre designs being developed for the new technique of swift amphibian warfare. Some of them are marine nightmares and most of them are unorthodox enough to curl the hair of an old seadog.

Chris-Craft is now manufacturing strange boats like the square-cut, fast landing barge shown *below*.

We needn't discuss the lumbering landing barges that crawled up on the beach at Dieppe and spewed out tanks and fighting men. They are as queer contraptions as ever sailed the seas since the carved and be-shielded boats of the ancient Norsemen. Nor need we take much space to talk about the Tokyo radio broadcast describing the "new secret weapon employed by the Americans at Subic Bay—a strange monster with great, flapping wings that fires in all directions." Lt. Bulkeley taught the Japs that that was a PT. There are much more queer creatures riding the waves today than either of these!

An example of the type of bizarre boat designs evolving from the wartime effort is this queer "spoonbill" landing boat. It has unusual high speed.

War

by Captain Charles Borden

"A weird machine with great flapping wings which fires in all directions" is the way a Tokyo broadcast described the American PT boat after the first American attack at Subic Bay. The picture above explains the description.

And there are thousands of them! Thus far, few people have realized the vast importance they have assumed in the war.

Everyone knows the part small boats played at Dunkirk. The public passed off this event as a freak. But the public should have begun to realize what was happening to methods of warfare after the shows at Tobruk, Subic Bay, Cebu, Lofoten, Dieppe, in the Aleutians, and, finally, in the Solomon Island.

Huge fleets of these armored amphibian tanks are now being turned out for America's coming amphibian blitz. The Marines used these recently.

These actions make it more and more apparent that the Army is going to war in small boats! And that the small boat is going to play a major part in the landing-invasion type of warfare with which we are faced.

And since great battleships, aircraft carriers and naval bases like Singapore and Manila have proved vulnerable, the new "hit-and-wiggle" boats are rapidly emerging as the deadliest weapons in the Navy's new bag of tricks.

There is much "hush-hush" about the strange craft being launched above. It is known only to be specially designed for tank-carrying.

The Fairmile Subchaser shown above was "restricted" by censorship until recently. It is Canada's contribution to the list of small battle boats.

In both the Army and the Navy, then, we begin to see such strange things as these, to name a few:

The *Crocodile* Boat, an armored, ramp-faced monster for landing heavy tanks and guns.

The *Spoon* Boat, a queer craft with a spoon-shaped bow, for landing foot soldiers on a beach.

The *Alligator*, a combination land tank and boat, which crawls up on the beach on amphibian treads and goes straight into land action.

The *Hornet*, famous "bell-bottomed" British fighting runabout.

The *Schnellboote*, the well-known German "E Boat," developed for fighting in the restricted areas of the English channel.

A fabulous, newly-developed U. S. tank-carrier, differing entirely from the well known tank-landing barges. It has been called "a sea going panzer unit," but its details are so secret that little can be said about it. Only one picture of it has been released by the Army. It accompanies this article.

The attacks that took the beaches of Guadalcanal in the Solomons and the Andreanof Group in the Aleutians, the sea raids that made land commando raids on Dieppe possible, the smashing descent on Nazi held Norway's Lofoten Islands all were made by specially designed and recently developed small raiding boats.

The big problem of modern invasion warfare is to get sufficient men and 21 ton tanks swiftly and safely established on open beaches under a hail of enemy steel. Consequently the Army now goes to sea in a big way with an armada of small boats larger than both the Navy's and the Coast Guard's together! From rubber boats to steel transports and including triple screw scows, unsinkable balsa boats, assault barges, panzer units and rescue boats, the Army's navy includes over 42 different types.

Up to very recent times invasion troops were landed in heavy, clumsy rowboats, making it almost impossible to land and assemble a fighting force quickly enough to take an enemy beachhead under fire.

Now, speedy 36-foot *Crocodile* Vehicle boats drawing but three feet, with double bottoms to bump their way over logs, rocks and sand bags, dart swiftly in, carrying tanks, gun trucks and everything necessary to launch the attacking force immediately into action

against the enemy. Highly maneuverable and able to turn in twice its own length or shift instantly into reverse, it thus avoids planes and is protected from shore batteries by side armor. When first beached with huge ramp mouths falling forward to allow the tanks to splash and rumble ashore they look like strange denizens of the deep, puking out destruction to kill the enemy.

As important as any craft in the invasion fleet, the Army's new 36-foot plywood landing boats are specially designed to speed ashore at 18 m. p. h. carrying a landing party of 29 Marines, 2 machine guns, a coxswain and an engineer.

Above: The famous and secret German "E boat," also called the "Schnellboote," is an English channel fighter.

The British "Hornet," shown above, is the English answer to the German "E boat," and these two types of small craft meet in almost daily battle.

The American PT is our counterpart of the "E boat" and the "Hornet." The remarkable closeup seen above is of America's recent design of a PT.

An armored British motor torpedo boat, above, is an extreme example of unorthodox designing. It is 70 feet long and has three 1,000 h.p. engines.

Amphibian tanks, America's triumphant new invasion weapon and to date among the midget navy's star performers are dropped directly overboard from transports and operate equally well afloat or ashore. About their remarkable new features and amazing performance I am not allowed to write at this time. But when the zero hour arrives for the big push they will be right up there in front with the Marines. You will hear plenty about them.

A small boat building program second only to plane production is underway at the present time. Within one year it will provide America with the mightiest small boat navy in the world and within three years with more small fighting boats than all the rest of the world together. Rush orders are going out for a thousand boats at a time and the Small Boat

The freak boat *above* is boom-defense craft, protecting the harbor defenses of Great Britain. Exceedingly fast and sea-worthy is this small, armored patrol gunboat made in England.

Building Association recently completed and presented plans to the Navy for construction of 30,000 small fighting boats during the year to establish a steel clad protective chain around the entire vital coastlines of North America.

Not to be outdone by the big boys like Kaiser and Bechtel, the small boat fellows in breaking all previous production records say, "Just give us the orders and we'll keep 'em splashing."

Dubbed the Hell Shipyards a large Portland concern are launching what they call the *Hell-Class*-Ships to carry such names as, *Hell For Hitler, Hell For Breakfast, Hell in General,* etc.

You would have been examined by a sanity board a few years ago if you had suggested building the entire hull sides and bottom of a 78-foot motor boat out of thin plastic bonded plywood. Imagine partitoning and decking it with ¾" ply, moulding its machine gun turrets of the same and then heavily arming it with four 21-inch torpedoes, four 50-caliber anti-aircraft machine guns, a rapid firing stern gun, eight depth charges, smoke screen apparatus, listening devices. Eight men man that boat to cruise 1,500 miles across the sea, blitz into an enemy harbor, sink a 40,000 ton battleship and escape at 60 miles per hour. That is what the latest mosquito boats can do.

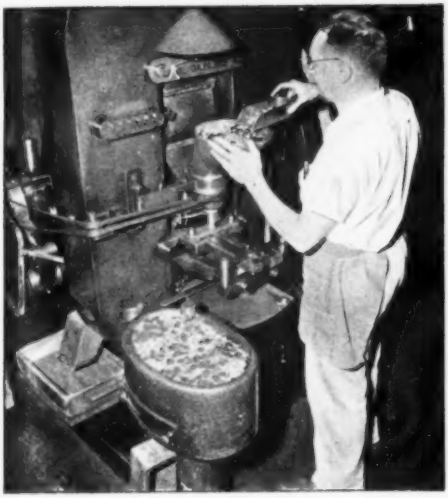
More than any other craft they possess the winning qualities of initiative and surprise and, though but 1/20th the size, pack much of the hitting power and are stealing most of the duties formerly held by destroyers.

Modern plywood is one of the most important factors in making such thrilling exploits a reality. The saving of precious hours by the elimination of caulking and other details answers today's biggest problem. The Army and Navy like it because it won't split or crack, has exceptional durability and the *resultant lightweight increases speed threefold!*—enabling a slick little P. T. to pounce on a sub like a cat on a mouse and depth bomb it to oblivion.

Amazing new Jungle-Boat-Trucks are the latest brain child of Dudley P. South of Higgins Industries in New Orleans. Already the proud father of torpedo and invasion boats, Mr. South has specially designed his new amphibian monster to operate in shallow water, climb up and down rocks, up rapids and slither over river banks with a full cargo of raw rubber. [*Continued on page* 183]

NEWS OF SCIENCE AND MECHANICS

THE NEW NICKEL
MOSQUITO BOMBER
USED-HOUSE LOT
PLANES IN OVERCOATS

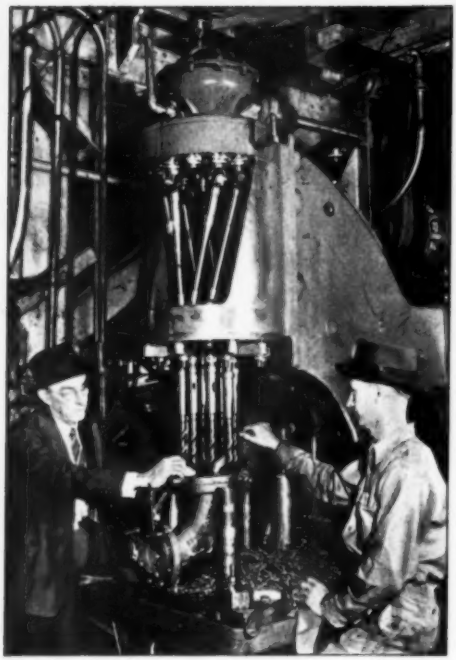


New Diet For Turnstiles

SHOWN above are two steps in the production of new nickels, intended to release needed metals for war uses. Their appearance and weight will be the same as the Jefferson nickel. Instead of 75% copper and 25% nickel, however, the new nickel will contain 56% copper, 35% silver and 9% manganese. Left, blanks are being fed into the machine that stamps "heads" and "tails" on them; right, stamped nickels are being washed.

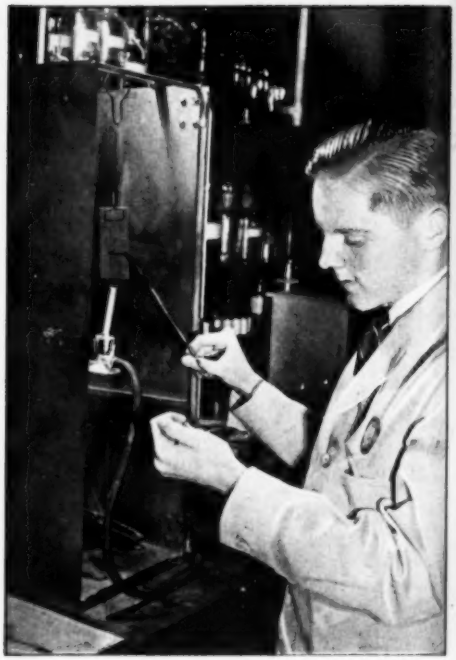
No More Ups And Downs

SOMEBODY figured out that electricians wiring barracks at Fort Lewis, Wash., travelled a half-mile a day climbing up and down stepladders, and suggested that they could save a lot of trouble by using stilts. From the way the four men pictured here have taken to it, the idea appears to have been a good one. But now the men feel strange, they say, when they come down to earth.



Machine Tool From Junk

WITH old Ford transmissions, universal joints, and truck drive shafts, Sam Carter of Los Angeles made this multiple precision drill press for turning out needed ship fittings and valves at a California war plant. Until he turned his talents and scrapped parts to the task, the plant was threatened with a halt for lack of equipment.

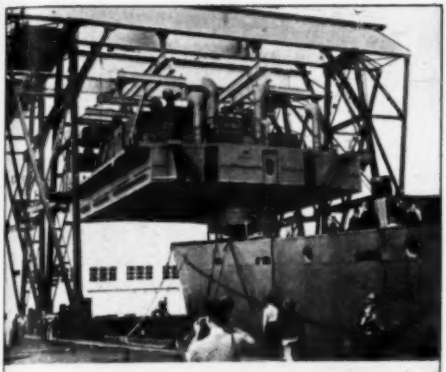


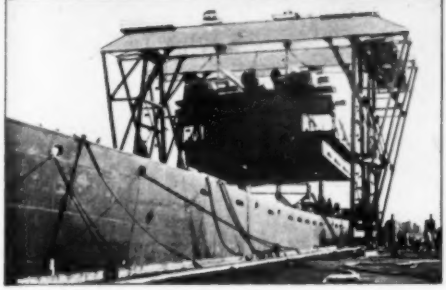
Boy In A Man's Job

JOHN TODD, above, and four other crack science pupils are relieving the manpower shortage at a Yonkers, N. Y., rug plant by working three hours every afternoon after school, plus Saturday morning, as chemical testers, usually a man's job. Here Todd tests canvas duck for fire-resistance as required by the Army and Navy.

Microscope Built On Microscopic Scale

JOSEPH P. KLEIBER of Rochester, N. Y., spent a year's spare time making this tiny microscopic scale. Though only 2¾-in. high, with a ¾-in.-square stage, it works like the full-scale model which Bausch & Lomb hires him to assemble and adjust. The miniature has adjustments for focusing the binocular-type microscope. The instrument is kept under a de-necked pill display bottle.





Super Superstructure

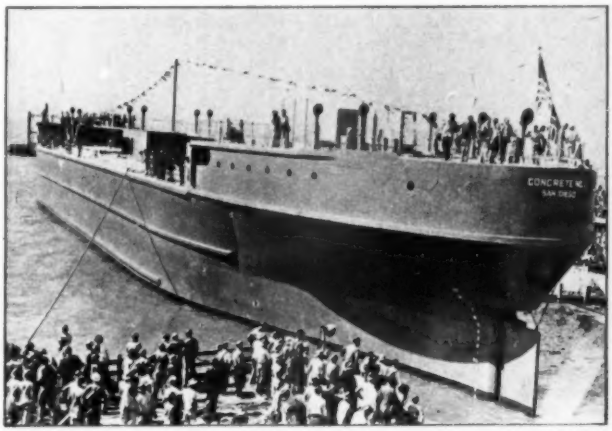
MOVING the whole superstructure, complete to electric light bulbs, into place at once by means of a huge sliding crane is one of the secrets of Henry Kaiser's superswift (10 days) construction of Liberty ships. The superstructure weighs 165 tons. A few seconds after the lower picture was taken, the crane placed the wheelhouse.

No Guessing At Gas

TO ANSWER the need for educating civilians to poison-gas dangers, Harry E. Pfaltz turned his perfumer-blending experience to devising a kit of five accurately-imitated poison gas odors, harmless and OCD-approved. Tabs of absorbent paper are dipped into the liquids and sniffed for the identifying odors.

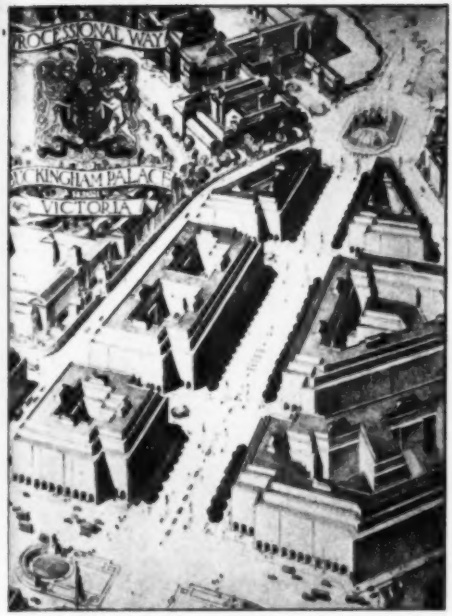
First New Concrete Ship Leaves Yards

FIRST of its kind built for the government since 1920, this 375-ft. concrete fuel barge, Concrete No. 1, leaves the Concrete Shipbuilders' Yards at National City, Calif. Weighing 14,000 tons and with a liquid capacity of 8,000 tons, the barge requires a minimum for its size and capacity of precious supplies of steel, will help keep fuel oil moving from Gulf ports to East Coast homes this winter.



Up, Scooters, To War!

SCOUTS report the approach of the enemy from the next street. Sirens, whistles, and treble yells bring the gang scooting to the defense of the block. Two lads man the super ack-ack gun, *above*, unique in being mobile and entirely of wood. (Planes for making a child's "anti-aircraft gun" like this begin on page 146 of this issue.) Their cohort on the sea keeps an alert finger on the gun of his PT boat, *left*, while a grim machine-gunner covers the advance of a reconno-peep car, *lower left*, and a heavily-armed tank of M-3 lineage rumbles to attack. Armed with these new military scooters, the block is ready!



"A World You Never Knew"

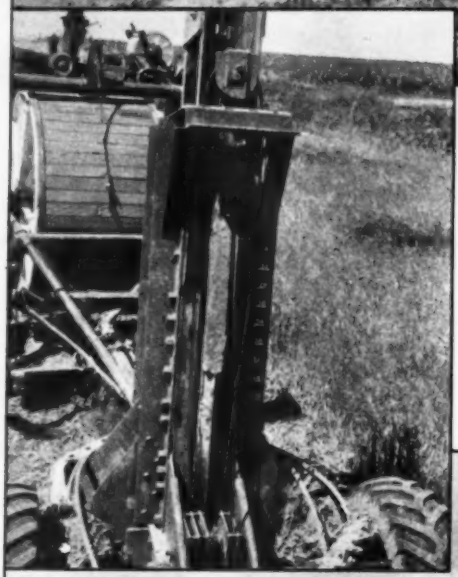
WHEN the war is over, a new London is going to rise on the bomb-pocked site of England's capital. Reproduced above is a design by the Royal Academy for part of the new city—a "Processional Way" leading from Victoria Station, London's principal railroad terminal, at lower left, to Buckingham Palace, at top center. Note the broad, straight thoroughfares and windowless buildings.

Bulletin Board Attraction

SMALL alnico magnets replace thumb tacks in an office of the General Electric Works Laboratory in Schenectady where a steel partition serves as a bulletin board. As alnico—an alloy of aluminum, nickel, cobalt and iron—is a powerful permanent magnetic material, tiny magnets hold large pieces of paper in place. The other attraction shown is Miss Marian Chambers, of the Laboratory staff.

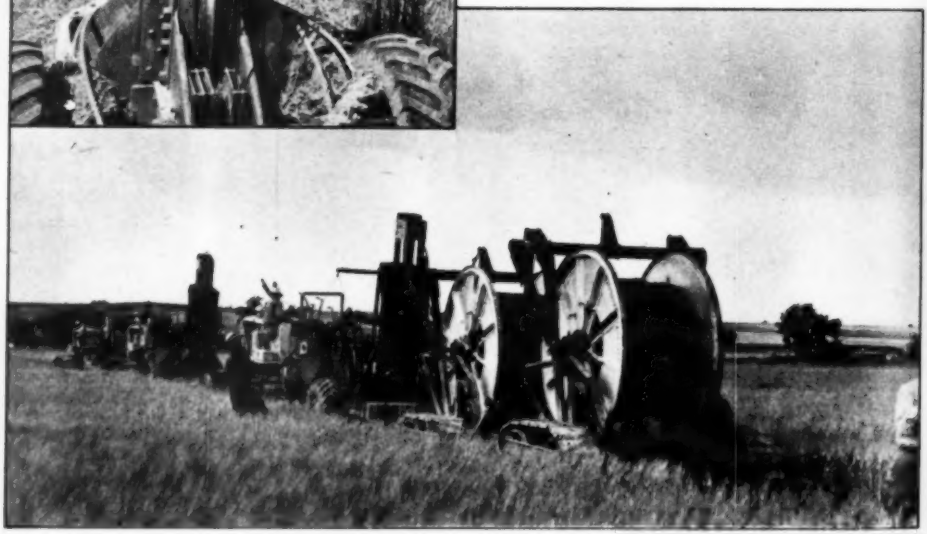
How Water Polo Looks To A Fish

DINERS in the Submarine Gallery of the Town House pool in Los Angeles can enjoy with their meals a fish's-eye view of swimming races or underwater polo as shown at right. Interspersed with the room's marine murals are living "murals" of the action going on in the adjoining swimming pool, seen through large windows of heavy plate glass set below the water level.



Cable Gets Plowed Under

NOT crops but a twin telephone cable is being plowed under in these pictures. Extending 607 miles from Salt Lake City to Sacramento, Calif., the cable forms the final link in the nation's first transcontinental telephone cable line, designed to provide service free from interruptions such as storms often have caused in the past. The cable is laid by a special plow, which "roots" a trench for it, feeds in the cable, and covers over the trench in a single continuous operation.

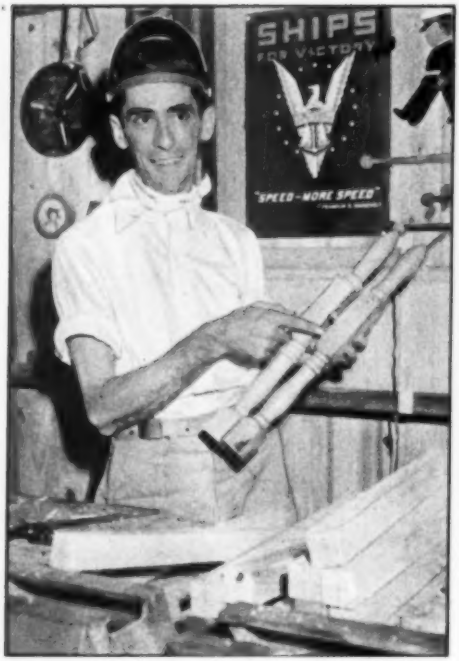


War Business: Used-House Lot

BECAUSE new houses can not be built, used houses have an active market value. So the Los Angeles Wrecking Company has established this unique sales lot for second-hand homes it acquires. Almost a million defense houses may be so marketed after war.

Football Was Idea For Non-Metal Cans

LIQUIDS can be contained in these non-priority paper, cardboard, and plastic boxes ten times stronger than tin cans, inventor Harry Waters claims. Each is like a football: a flexible lining potentially bigger than its semi-flexible container. (Right) Marjorie Gillies with a 15-gal. can that folds to one-tenth its size and a rigid 5-gal. size.



Spokesman Wins An "M"

DRIVING a mail truck daytimes isn't work enough for William T. Morris, 32, of Oceanside, Long Island. So nights he works in the basement shop he has fitted up in his home, turning out spokes for ships' steering wheels. To date he has turned out 12,000, winning the maritime commission's "M."

Juke Box' Grandpappy

WITH the production of new juke boxes curtailed, this 1886 Edison Multiphone, in operation at Columbia, Calif., in 1890, may come back into use yet. Right now it stands in the Pony Express Museum of W. Parker Lyon, in Arcadia, Calif. It plays 25 selections, on tubular records mounted on a wheel.

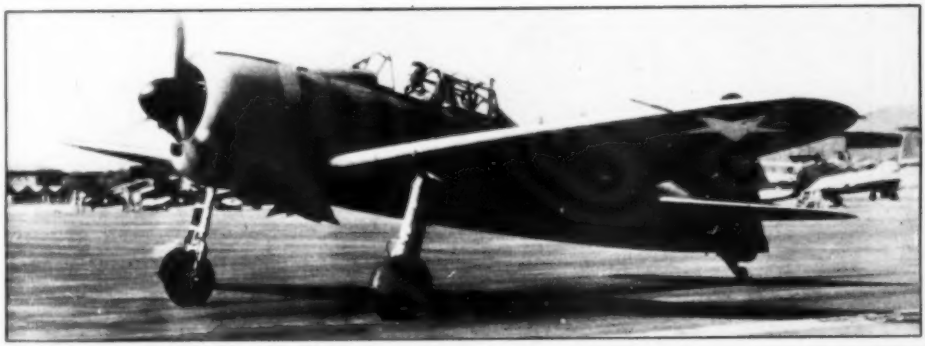
Clock Has No Hands, Springs, Or Cuckoo

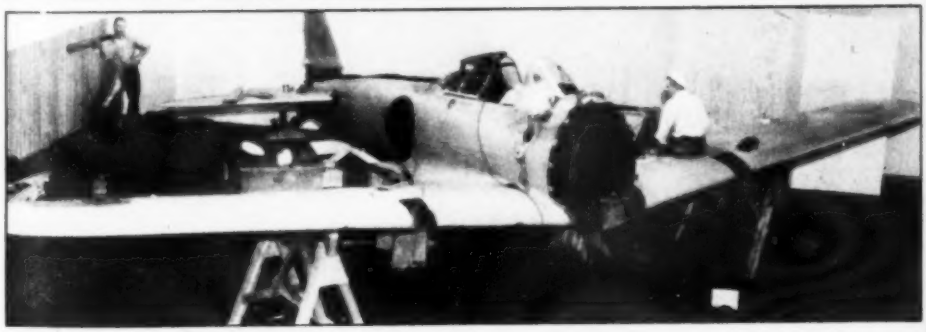
THIS novel electronic clock, developed in the RCA laboratories at Princeton, N. J., has no moving parts, no motors, springs, wheels or hands. But it does have more than 170 electronic tubes that count the 60-cycle pulsations of electric current and translate them into seconds, minutes, and hours by means of lights that blink on the front of the clock. It maybe your home's post—war clock.

NEWS OF MODERN WARFARE

U. S. Pilots Test Captured Zero

SHOT down in the Aleutian Islands, salvaged and reconditioned, (bottom picture) this Jap Mitsubishi type 0 fighter has given U. S. military men a comprehensive knowledge of the capabilities of this dangerous enemy plane. With the U. S. star insignia replacing the Japanese Rising Sun emblem, Lt. Com. E. R. Sanders, U.S.N., piloted it over San Diego (top), found it highly maneuverable, but extremely vulnerable.





Peepish New Vehicle Is Anti-Tank Fort

BASED on a peep, bigger and heavier brother of the jeep, this anti-tank fortress is ready to blast an enemy tank as soon as it gets in range. Protected by armor plate, the crew of the 37 mm. gun can bound into firing position in a moment with no time lost maneuvering the old towed type of gun into forward-firing position. Note rifles in holsters handy to front seats and spades strapped to sides.

Jap "Chatterbox" Has Flash-Hiding Muzzle

THIS light-caliber Japanese machine gun which American soldiers have dubbed "chatterbox" was captured by United States Marines during the early stages of fighting on Guadalcanal when the Yank land forces first took the offensive. The suitcase-like handle on the barrel evidently was applied to facilitate carrying. The bell muzzle hides the flashes made by the gun while being fired, aiding concealment.

Park A Satchel, Blow Up A Tank!

PARK a 20-lb. satchel of TNT on the bogey of a light tank, as Sgt. Carl Hardy of Shelby, N. C., is doing in the photograph at left, and the tank will be wrecked and its occupants, generally four, will be killed.

That's just one of the techniques of anti-tank warfare taught tank stalkers. Ordinarily, of course, that machine-gun behind the turret would be putting up a protest against such satchel-placing.

Cool Killer

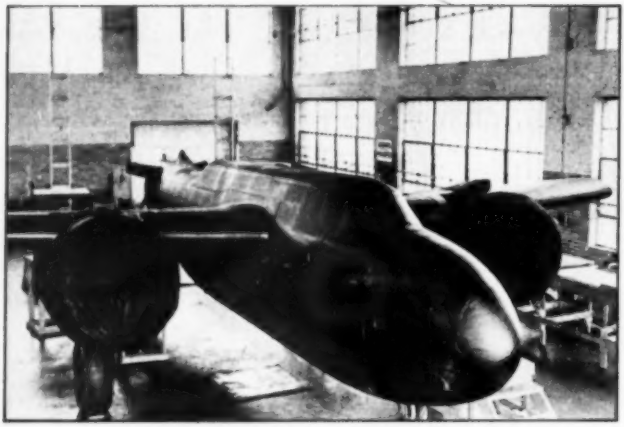
THE water-cooling system in the jacket on the barrel of the U. S. Army's heavy machine-gun prevents it from failing through overheating as was sometimes the case with old types. Manning this gun on maneuvers are Pvt. Robert Hutcheson of Red Bay, Ala., and Pvt. Virgil Lorence of Lucerne, Mo.

Block-Buster Lovers

NO WONDER Rita Hayworth loves this replica of a bomb of block-busting promise—it gives a good idea of the big units of TNT our planes are using to destroy Nazi manufacturing centers. Los Angeles' OCD workers are displaying this bomby family; "Max," the biggest, is 16 ft. Block-Buster.

British, Too, Train For Mass Gliding

U. S. TRAINING for carrying troops into combat zones by glider is being paced by Great Britain where Air Force men are practicing with gliders like these Hotspur models. Here R.A.F. instructors in the pilot's tonneau give pointers to helmeted paratroopers at one of the special airdromes of the British Glider Regiment. These gliders vary slightly from American types.

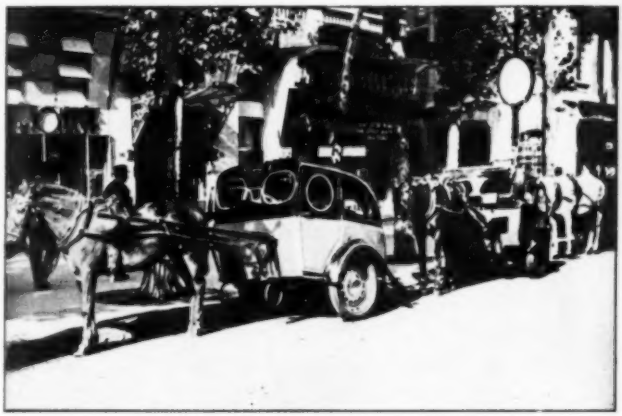


Warplanes Travel In Overcoats

A TOUGH overcoat to protect aircraft and tanks against the weather in transit from factories to United Nations battle forces is provided by a coated fabric called Revolite. A product of the Atlas Powder Co., Revolite is roll-coated for this wartime job with a special type of Bakelite resin. At left is a new bomber completely taped, ready for shipment.

Paris Taxis Not What They Used To Be

BEFORE the war the typical Paris taxicab driver was a unique cross between Barney Oldfield and a lunatic. But not any more. Because there is no gasoline available, and very little rubber, the cabs shown at right have had their front ends sliced off, and horses substituted for their motors. And no fares, at that. Note the almost deserted streets in this picture, taken at noon.

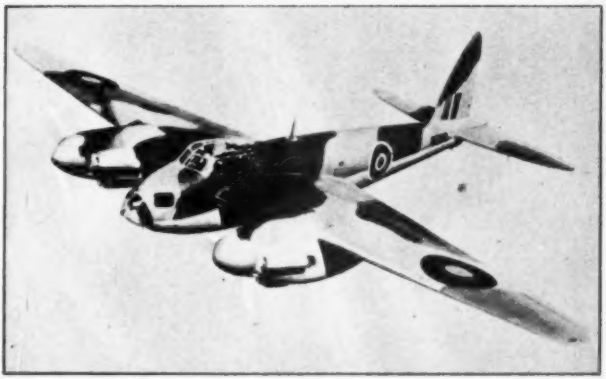


They're Mining Steel Now In Our Streets

THIS ingenious device, invented by a California WPA worker, attacks the scrap shortage by recovering buried streetcar rails. One end of a rail is first dug up by hand, and placed over a steel roller attached to a tractor equipped with a cutting tool. As the tractor moves forward, the cutting tool knifes through the pavement and the rail peels up over the roller in a continuous ribbon of scrap.

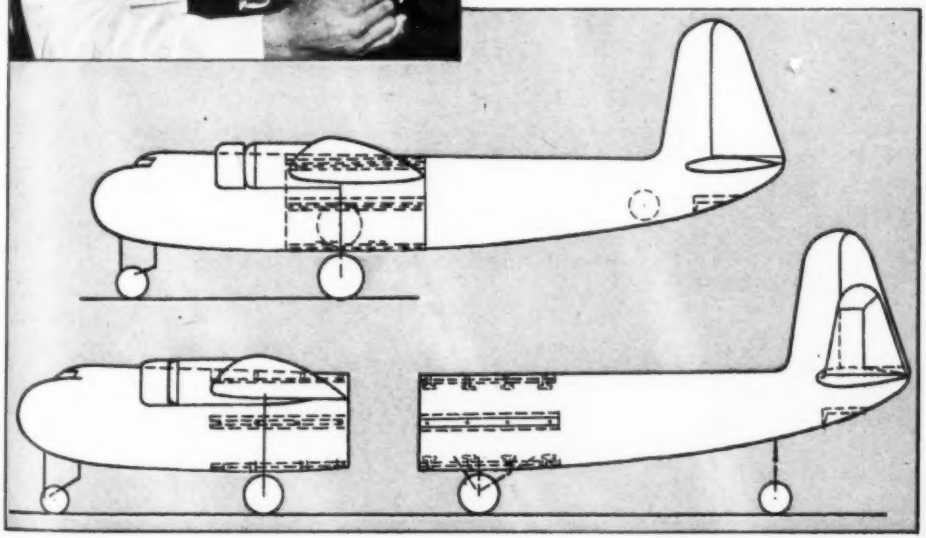
This Mosquito Has A Sting For Hitler

THIS is the first released picture of Britain's sensational new de Havilland "Mosquito" reconnaissance bomber. Powered by two Rolls Royce engines, the wood-built Mosquito has a span of 54′ 2″, an overall length of 40′ 9½″. Probable armament: four 20mm. cannon and four .303 machine guns. Speed: a military secret.



A Trailer For Air Freight

LONG before large-scale air freight, such as the U. S. Army now operates all over the world, was more than a daydream to most people, Benjamin C. Scheufele was working on his recently-patented design, below, for freight trailers of the skyways. Scheufele's air truck is made up of two separable parts, one of which carries the engine, the other the cargo. Chief advantage claimed is that this frees the engine unit from having to stand idle during loading and unloading; being switched from one cargo to another, it can remain in operation almost continuously. Also, the cargo-carrying fuselage can travel from point of shipment to destination without its goods having to be trans-shipped.



Dogs Of War Are Husky

DOGS helping fight this war have to be husky enough to bear a light machine-gun (*see left*), so what is more natural than to choose Siberian huskies for the job? Their age-old place as workers beside men in the far north specially qualifies them for war tasks over uncharted ice fields in the Arctic or mountains. By hauling jaloppies (*above*), huskies at Wonalancet, N. H., train for sledge-pulling even before snow flies.

Germans Put Muzzle Brake On Big Guns

HAVING proved a muzzle brake efficient on small pieces carried by individual soldiers, the Germans have adapted the device to bigger guns like this anti-tank cannon captured by the Russians on the eastern front recently.

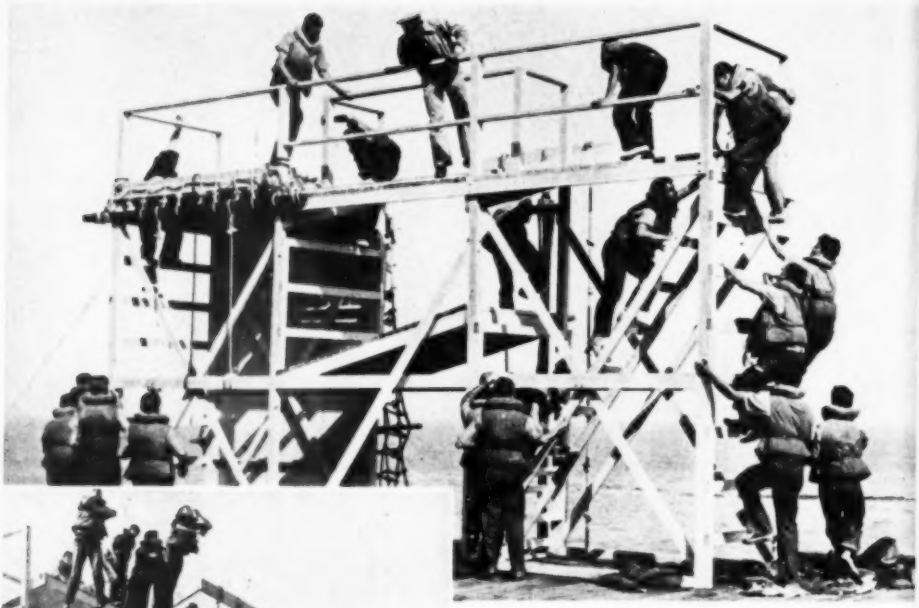
The muzzle brake lets gases escape so as to reduce the gun's recoil.

Deadly Waterbug

FORE-RUNNER of the Bellanca torpedo boat (see Dec. MI), this plywood 50-m.p.h. sea-skimmer chases subs with four depth-charges or torpedoes and two machine-guns.

New British 6-Pounder Does Double Duty

THE British Army's new, versatile gun firing a six-pound shell can be used as a field gun, as shown at right, and also in tanks. With a high rate of fire and excellent armor-piercing qualities, it has been highly praised by crews using it in African desert fighting recently. Of maximum maneuverability, it is one of Great Britain's most effective answers to the special problems of African war.



"Tanker Torpedoed; Crew Saved!"

THIS complicated framework is not a new wrinkle in playground equipment. It's an exact frame replica of a ship's quarters, and the men climbing around on it are Cadets of the U. S. Merchant Marine, training to obey with practiced speed the command: "Abandon Ship!" At top, they don life jackets, climb ladders through narrow hatchways to a tilting deck. At left, they are going "over the side."

Fashion Note For Eight Miles Up

THE Martian-appearing men at left are U. S. Army pilots in training at Kelly Field, Texas, wearing the newest of high-altitude masks for stratosphere flying. Made of plastics, these masks not only maintain for their wearers a livable air pressure in rarefied asmospheres, but also protect them against fire.

CRAFTS AND HOBBIES

Baby Ice Scooter. See page 134.

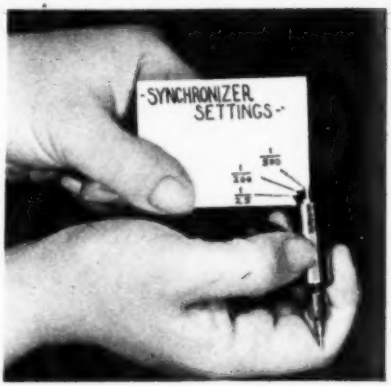
PHOTOGRAPHY • MODELS • RADIO
THE HOME WORKSHOP • HOUSEHOLD
KINKS AND FUEL-SAVING IDEAS
WOOD • METAL WORKING • TOYS

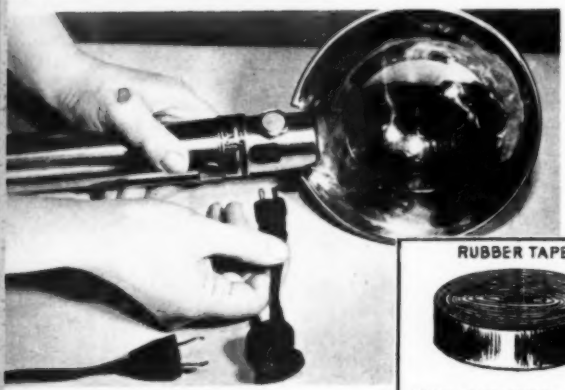
FLASH KINKS

by Louis Hochman

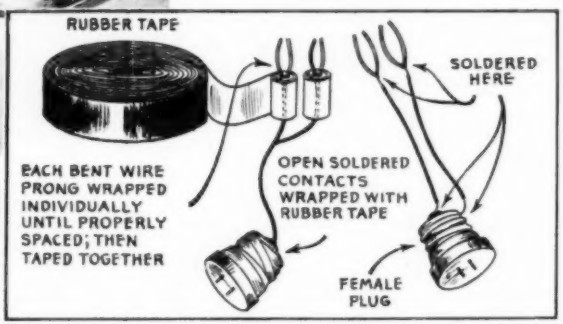
Left: If you are ever embarrassed by failing flash batteries when away "on location" without a handy reserve supply, you can revive them temporarily by warming them up on a hot radiator and use them after heating, in your flash synchronizer's battery case.

Right: A cardboard guide, marked as in the illustration, permits quick adjustment of flash synchronizers whose timing is controlled by a set screw, when different shutter speeds are used. Most cameras require a different time to reach full shutter opening when set for 1/25th second than they do for 1/200th, etc.





EXTENSION PLUG ADAPTER (*left; below*): Many commercial flashguns come with outlets for extension work requiring special, and often expensive, electrical fittings. The adapter illustrated and described here gets around this difficulty. It requires short lengths of heavy wire, bent, soldered and insulated as in the diagram, plus friction tape and a standard screw-in plug. The spacing of the prongs is controlled by the amount of tape wrapped around them. The adaptation can be made for any and all available flash equipment.


RUBBER TAPE
SOLDERED HERE
EACH BENT WIRE PRONG WRAPPED INDIVIDUALLY UNTIL PROPERLY SPACED; THEN TAPED TOGETHER
OPEN SOLDERED CONTACTS WRAPPED WITH RUBBER TAPE
FEMALE PLUG

Left: To prevent premature flashing of midget lamps used in Kelart midget reflector-adapters, with metal battery cases, insulate the angle bracket of the reflector with a rubber finger, as shown.

Right: To test midget flash extension setups for possible breaks, place a 6 to 8-volt auto dash bulb in the reflector or adapter socket. As weak a power source as two penlite cells will make it glow if connections are unbroken.

PHOTO CONTEST

FIRST PRIZE ($10.00): By Jerry Kalawsky, 520 East 11th Street, New York, N. Y. Taken with an Ikoflex II camera, on Super XX film, developed in DK-20; f/16, 1/100th second. SECOND PRIZE ($5.00): "Hitch-Hiking" by Glen Katzenberger, RT2—Box 929A, Bremerton, Wash. Taken with a 2¼x3¼ Graphic, on Agfa Superpan Press film; f/3.5, 1/800th second; developed in D-72; orange filter. THIRD PRIZE ($4.00): "Encore," and FOURTH PRIZE ($3.00): "Giving Her All" both by J. J. Gerard, 662 3rd Street N. E., Mason City, Iowa. Both pictures were taken with a Dollina II camera, on Plus X film, developed in DK-20. Third prize, exposure f/11, 1/50th second, 1 spot. Fourth prize—f/11, 1/100th second.

The MECHANIX ILLUSTRATED Photo Contest is run on a month-to-month basis. If you did not win one of the four prizes in this month's competition, try again. Important considerations in the judging are the eye-appeal and subject interest of the photographs that you submit.

Submit prints for this month's contest unmounted—no larger than 8x10 inches. With each print list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints cannot be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

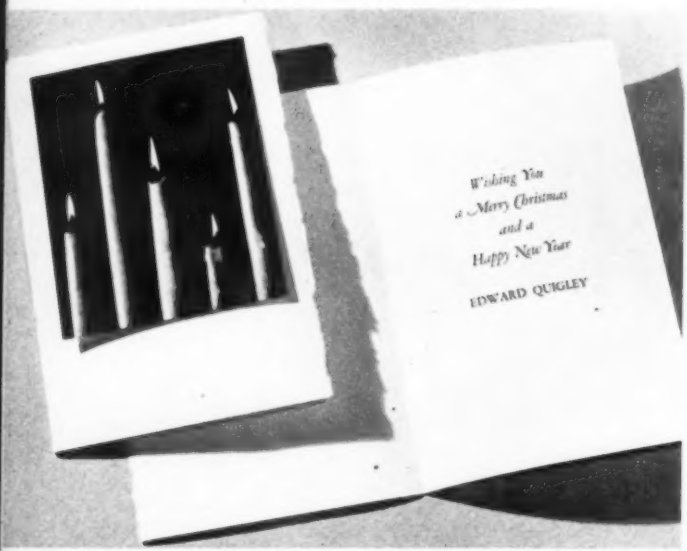
1st PRIZE

2nd PRIZE

Personal

by Edward Quigley

Above: An original perspective of conventional holiday subject material makes an excellent illustration for a personal photo greeting card. The tree ball shows a direct reflection of a portion of the room in which the picture was made. *Below:* A typical photographic greeting card made by the author. As for the picture itself, the candles are portrayed very realistically.



THE commercial greeting card is a rather cut-and-dried way of extending holiday greetings. Commercial cards are all very much alike; yet, most anyone can make his own card, and put some touch of his own personality in it. This card will naturally have more message for the recipient than the store variety, and will not be duplicated by some other friend.

The personal card can be made in a number of ways. Each card can be a straight "art" product, if the maker is talented, or it can be done in a medium that lends itself to duplication, as with the linoleum block.

Or the card can be made by photography.

The photographic card requires much less skill than the other mediums. If one knows how to develop and print negatives, he will be able to produce some type of greeting card.

Strangely enough, the first thing to do is to select the envelope; for it is easier to make a card to fit the cover, than to make the card and then find that there is no envelope quite that size. And a neat fit helps the general appearance.

The main difference between a photographic print and a photographic greeting card is the greeting inscription on the latter. The simplest way to make a print serve as a greeting card is to mask the paper when printing so that there is a generous margin at top and sides, and double the space at the bottom. Then when

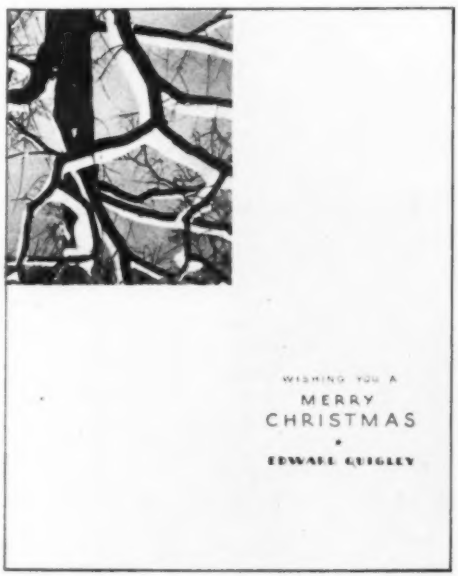
Photo Greetings

Below: A greeting card illustration subject built around the family—open multiple flash shot; one bulb in the fireplace.

the print is dried, take pencil or pen and write in the bottom space, "The Season's Greetings," or what you will, and sign your name. A colored pencil is effective for this, red being especially helpful in brightening the card's appearance.

Or you might make a photographic copy of a large layout including a photographic enlargement and careful lettering of the sentiment and the name. The copy is made to the exact size of the final card; every contact print yields the picture and the message as well.

My favorite method is as follows. Some pleasing single-weight cover-paper is selected from the stock of a paper-supply house. This is cut in sheets so that it may be folded book-fashion, to make a folder of about 4¼x5½ inches, and the small print, made without margins, is mounted on the front, with a ⅝-inch margin at the top and sides, and 1 inch at the bottom, the print being tacked only at the top. The greeting is placed inside, on the opposite page, and is done either with colored pencil, or by means of a printing press. You will be surprised to learn how inexpensively the average printer will print your name and [*Continued on page* 161]



Above: A completely photographic French-fold greeting card; made on foldable "Ad-type" paper. *Right:* A human interest type of still-life setup very appropriate for the Holidays.

"BEHIND" THE SNAPSHOT AWARDS

How the winners of the 8th Annual Newspaper National Snapshot Awards were chosen — $12,500 in prizes!

by
Norman C. Lipton
Photography Editor,
MECHANIX ILLUSTRATED

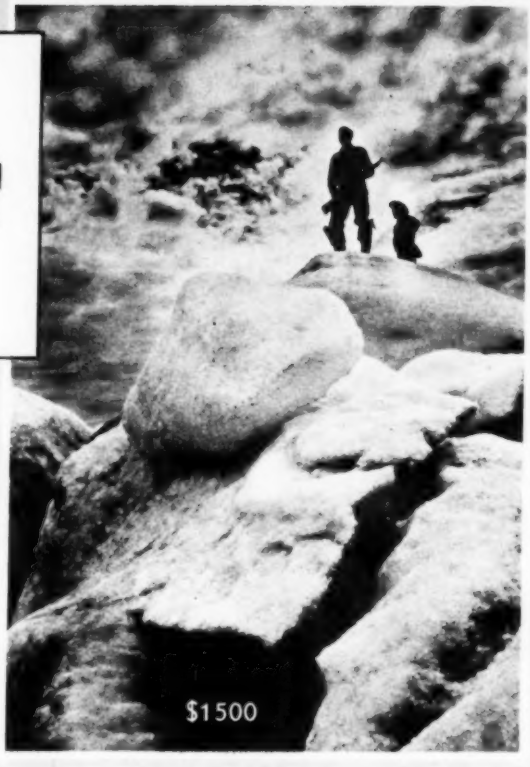


Fig. 1 *(right)*: The Grand Prize winner, by Corp. Kenneth C. Pratt of Northvale, N. J.—entered in the National awards by the N. Y. *Herald Tribune*.

Fig. 2. First prize winner in the Babies and Children group (Class A), by C. R. Schlemmer, Lincoln, Nebr., entered by the *Lincoln Journal and Star*.

A SHOT of two soldiers on guard at a North Pacific outpost was awarded the $1,000 Grand Prize in the 8th Annual Newspaper National Snapshot Awards, recently judged at the National Geographic Society in Washington, D. C. The entry (Figure 1), contributed by Corp. Kenneth C. Pratt of Northvale, N. J., earned a total of $1,530—including a $500 award as the best photograph in the National eliminations by a member of the armed forces (of the United States and Canada); a weekly prize of $5 in the New York *Herald-Tribune* eliminations, in which it had originally been entered, and the newspaper's Grand Prize of $25.

Fig. 3 *(left)*: Second prize winner in Class A, by Corp. Donald M. Laskey, Grand Rapids, Mich., submitted by the *Pittsburgh (Pa.) Press*. Fig. 4 *(above)*: Snapshot by Minturn R. Allen of Hartford, Conn., which won the third class prize in the Babies and Children group. This entry was submitted by the *Hartford (Conn.) Times*.

This photograph is one of the most important prize winners of the past year; for, by virtue of a series of preliminary, local snapshot contests, conducted by 69 newspapers throughout the United States and Canada, during the past summer, it is the best of more than a quarter of a million competing photographs.

The judges chose Corporal Pratt's entry by unanimous agreement because of its timeliness and dramatic symbolism, and also because the technique contributed to the mood of the scene portrayed. It was made with a relatively-inexpensive amateur camera on one of the more popular amateur films. It is interesting that no filter was used to bring out the cold, foreboding sky. Obviously, the brief exposure needed to reproduce the two figures in silhouette also served to record the snow texture in all its detail and to darken blue sky patches which showed through the broken clouds.

To this writer, the selection of Corporal Pratt's entry as the Grand Prize winner is particularly interesting. As in the case of the 7th Annual Awards a year earlier, timeliness proved to be the "plus" factor that won the judges' favor. In the previous contest, a closeup of a soldier and his fiancee bidding each other good-bye at a Canadian railroad station won the Grand Prize. At that time, mobilization was the order of the day; now, it is vigilance and service.

Fig. 5. First prize winner in Class B—Young People and Adults—made by Wilfrid Belanger, Montreal, Que., Can.; from *Montreal La Presse*.

Fig. 6. First prize winner in Class C, Scenes and Still Life, by George Goodfellow, Highspire, Pa., entered by the *Harrisburg (Pa.) Evening News.*

In addition to Class E (Army-Navy) from which the Grand Prize winner was chosen, there were four other classes in the National selections, which were conducted in Explorers' Hall of the National Geographic Society. These are: A. Babies and Children; B. Young People and Adults; C. Scenes and Still Life, and D. Animal Life. From the 309 enlarged snapshots submitted by the participating newspapers, a $500 First, $250 Second, and $100 Third prize winner was selected, for each of the five classes. In addition, 75 Special Merit Awards of $50 each and 140 Honorable Mention Class Awards of $25 each were distributed among the five groups.

First prize in Class A. went to Charlotte R. Schlemmer of Lincoln, Nebr., for the spontaneous snapshot of the drummer boy illustrated in Figure 2. The judges were impressed by the exuberance and reality of

Fig. 7. This snapshot won the first prize award in the Animal Life group—Class D. It was made by Florence Higgins of Grangeville, Ida.; entered by the *Seattle (Wash.) Times.*

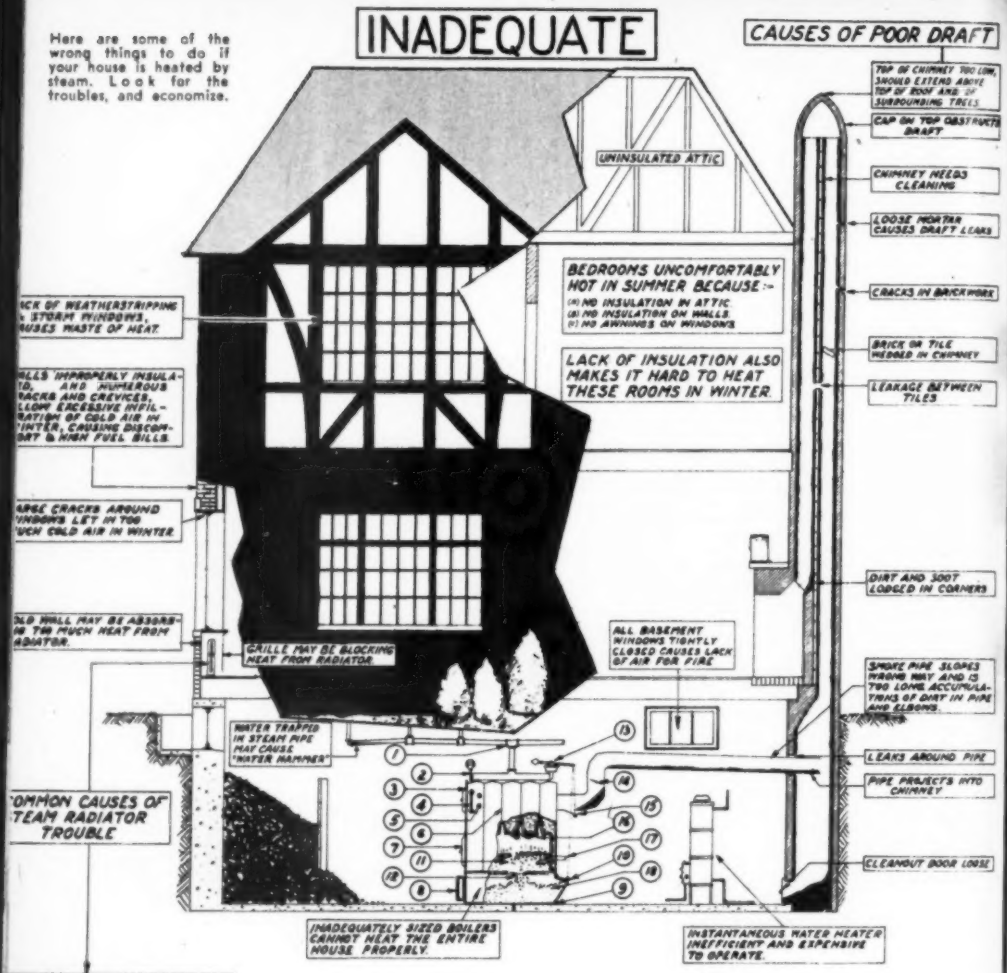
the action. The movement of the drum sticks was considered to be a favorable quality, too. No mention was made by the judges of the element of timeliness, but it was certainly there—as it was in the more obvious case of the third prize winner in this class, Figure 4, contributed by Minturn R. Allen, of Hartford, Conn. The youngster waiting on a street corner beside a large shopping bag (Figure 3) won second prize honors in Class A. for its story telling content and interesting lighting. The maker was Corporal Donald M. Laskey of Grand Rapids, Mich.

No baby pictures succeeded in getting into the major awards group in the Babies and Children class. The poses of the very young children and infants seemed to lack the freshness and dramatic novelty that the judges looked for. One of the $50 Special Merit Awards was a head study of a sweet young child but it was only a head. It had no story-telling quality.

The first prize in Class B. (Young People and Adults) was awarded to Wilfrid Belanger of Montreal, Canada, for Figure 5. The judges felt that the picture incorporated such points of excellence as strong composition, a natural occupational subject, rhythm, interesting sky, and angular lighting. These factors were not in equal evidence among other entries in the class. The second prize winner which we haven't space to illustrate was a shot of an old woman entering an old weather-beaten [*Continued on page* 180]

Fig. 8 Second prize winner in Class D, made by Gordon Carter, Dallas Center, Iowa, and submitted to the judging bythe *Des Moines Sunday Register*.

Fig. 9 *(above)*: Third Class D (Animal Life) prize winner by John F. McDermott, New York, N. Y., a second entry by the *New York Herald Tribune* qualifying to a major award. Fig. 10 *(right)*: Second prize winner in Class E (Army-Navy), by Walter Kowalchik, Muskegon, Mich., submitted by the *Muskegon Chronicle*. The merits of these and all other major prize winners, published and unpublished here discussed in the text.

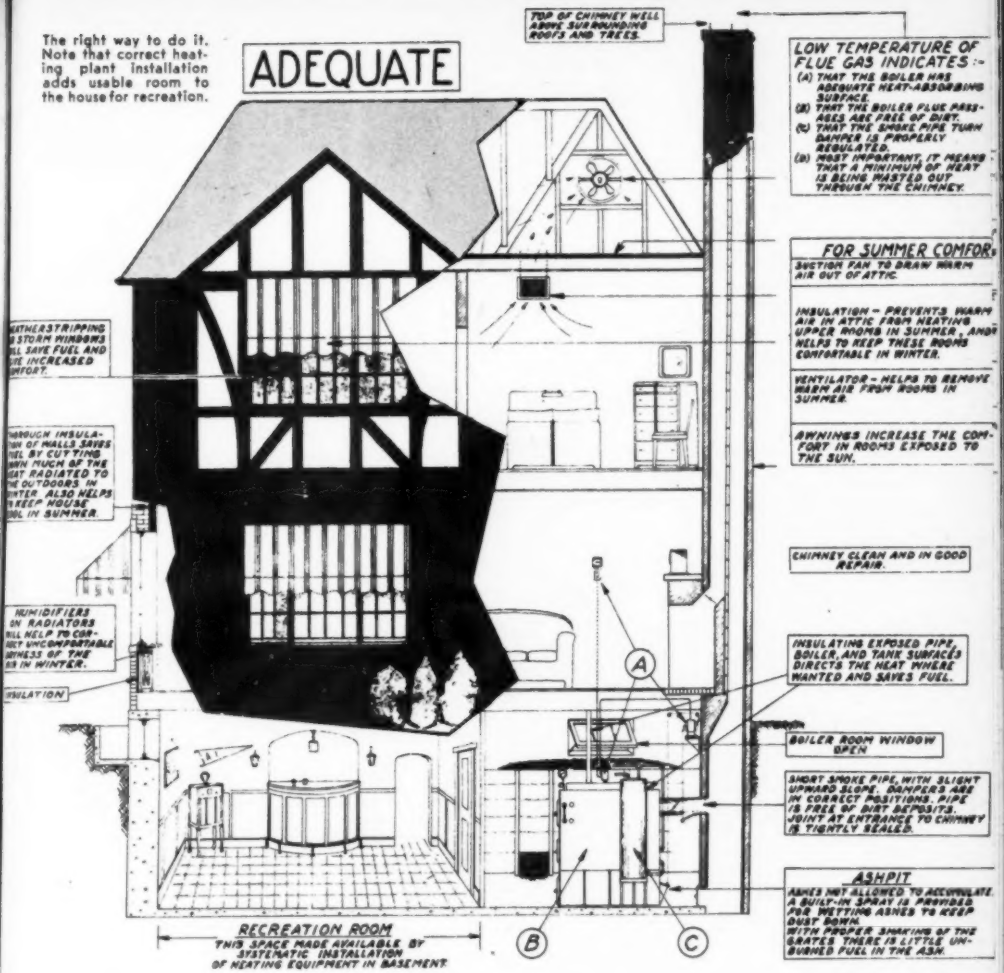

INADEQUATE
Here are some of the wrong things to do if your house is heated by steam. Look for the troubles, and economize.
CAUSES OF POOR DRAFT
TOP OF CHIMNEY TOO LOW, SHOULD EXTEND ABOVE TOP OF ROOF AND OF SURROUNDING TREES
CAP ON TOP OBSTRUCTS DRAFT
UNINSULATED ATTIC
CHIMNEY NEEDS CLEANING
LOOSE MORTAR CAUSES DRAFT LEAKS
BEDROOMS UNCOMFORTABLY HOT IN SUMMER BECAUSE:-
(A) NO INSULATION IN ATTIC
(B) NO INSULATION ON WALLS
(C) NO AWNINGS ON WINDOWS
CRACKS IN BRICKWORK
LACK OF INSULATION ALSO MAKES IT HARD TO HEAT THESE ROOMS IN WINTER
BRICK OR TILE WEDGED IN CHIMNEY
LEAKAGE BETWEEN TILES
ACK OF WEATHERSTRIPPING STORM WINDOWS, AUSES WASTE OF HEAT.
ALLS IMPROPERLY INSULA-ED, AND NUMEROUS RACKS AND CREVICES, LLOW EXCESSIVE INFIL-RATION OF COLD AIR IN INTER, CAUSING DISCOM-ORT & HIGH FUEL BILLS.
ARGE CRACKS AROUND INDOWS LET IN TOO UCH COLD AIR IN WINTER.
DIRT AND SOOT LODGED IN CORNERS
OLD WALL MAY BE ABSORB-NG TOO MUCH HEAT FROM RADIATOR.
GRILLE MAY BE BLOCKING HEAT FROM RADIATOR.
ALL BASEMENT WINDOWS TIGHTLY CLOSED CAUSES LACK OF AIR FOR FIRE
SMOKE PIPE SLOPES WRONG WAY AND IS TOO LONG ACCUMULA-TIONS OF DIRT IN PIPE AND ELBOWS.
WATER TRAPPED IN STEAM PIPE MAY CAUSE "WATER HAMMER"
LEAKS AROUND PIPE
PIPE PROJECTS INTO CHIMNEY
OMMON CAUSES OF TEAM RADIATOR TROUBLE
CLEANOUT DOOR LOOSE
INADEQUATELY SIZED BOILERS CANNOT HEAT THE ENTIRE HOUSE PROPERLY.
INSTANTANEOUS WATER HEATER INEFFICIENT AND EXPENSIVE TO OPERATE.
ADIATOR TOO SMALL TO PROVIDE EQUIREMENTS OF ROOM.
IR VENT VALVES NOT WORKING ROPERLY OR LOCATED TOO IGH ON RADIATOR.
ADIATOR RETURN TRAP OUT F ORDER.
CCUMULATIONS OF SCALE, MUD R GREASE INSIDE RADIATOR.
ADIATOR MAY NOT HAVE PROPER LOPE TO DRAIN OFF CONDENSATE.
WRONG
RIGHT

Save Your Fuel

You can cut down the fuel consumption of your home heating system if you follow these suggestions. Get busy at it now!

SAVING fuel is often much simpler than the average home owner thinks. Quite frequently the biggest trouble lies in the home owner himself—when he doesn't bother to check up on the heating system with which his house is equipped.

Merely having the boiler of a coal burning furnace cleaned can effect tremendous savings—if the boiler happens to be coated with soot or fly ash, as many home boilers are. Just $\frac{1}{32}$-inch of fly ash in an ordinary coal burning boiler will cause a 9.5% fuel loss. And a deposit of $\frac{3}{16}$-inch will cause a 69% fuel loss! So see that your boiler is clean.


The right way to do it. Note that correct heating plant installation adds usable room to the house for recreation.
ADEQUATE
TOP OF CHIMNEY WELL ABOVE SURROUNDING ROOFS AND TREES.
LOW TEMPERATURE OF FLUE GAS INDICATES :-
(A) THAT THE BOILER HAS ADEQUATE HEAT-ABSORBING SURFACE.
(B) THAT THE BOILER FLUE PASSAGES ARE FREE OF DIRT.
(C) THAT THE SMOKE PIPE TURN DAMPER IS PROPERLY REGULATED.
(D) MOST IMPORTANT, IT MEANS THAT A MINIMUM OF HEAT IS BEING WASTED OUT THROUGH THE CHIMNEY.
FOR SUMMER COMFORT
SUCTION FAN TO DRAW WARM AIR OUT OF ATTIC.
INSULATION – PREVENTS WARM AIR IN ATTIC FROM HEATING UPPER ROOMS IN SUMMER, AND HELPS TO KEEP THESE ROOMS COMFORTABLE IN WINTER.
VENTILATOR – HELPS TO REMOVE WARM AIR FROM ROOMS IN SUMMER.
AWNINGS INCREASE THE COMFORT IN ROOMS EXPOSED TO THE SUN.
WEATHERSTRIPPING & STORM WINDOWS ALL SAVE FUEL AND GIVE INCREASED COMFORT.
THOROUGH INSULATION OF WALLS SAVES FUEL BY CUTTING DOWN MUCH OF THE HEAT RADIATED TO THE OUTDOORS IN WINTER. ALSO HELPS TO KEEP HOUSE COOL IN SUMMER.
HUMIDIFIERS ON RADIATORS WILL HELP TO CORRECT UNCOMFORTABLE DRYNESS OF THE AIR IN WINTER.
INSULATION
CHIMNEY CLEAN AND IN GOOD REPAIR.
INSULATING EXPOSED PIPE, BOILER, AND TANK SURFACES DIRECTS THE HEAT WHERE WANTED AND SAVES FUEL.
BOILER ROOM WINDOW OPEN
SHORT SMOKE PIPE, WITH SLIGHT UPWARD SLOPE. DAMPERS ARE IN CORRECT POSITIONS. PIPE IS FREE OF DIRT DEPOSITS. JOINT AT ENTRANCE TO CHIMNEY IS TIGHTLY SEALED.
ASHPIT
ASHES NOT ALLOWED TO ACCUMULATE. A DAILY-IN SPRAY IS PROVIDED FOR WETTING ASHES TO KEEP DUST DOWN. WITH PROPER SHAKING OF THE GRATES THERE IS LITTLE UNBURNED FUEL IN THE ASH.
A
B
C
RECREATION ROOM
THIS SPACE MADE AVAILABLE BY SYSTEMATIC INSTALLATION OF HEATING EQUIPMENT IN BASEMENT

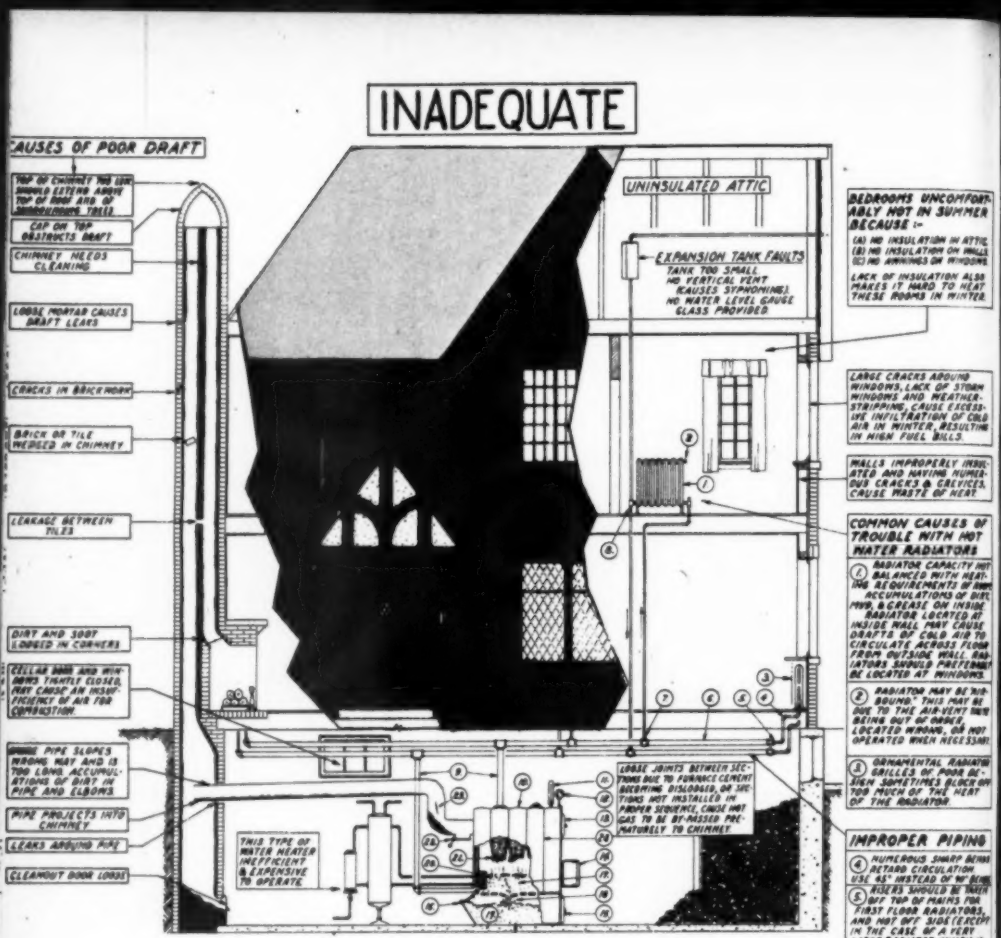
Remember that no matter what kind of fuel you burn, coal, oil, or gas, a mere ⅛-inch of soot is equal to two inches of solid concrete in preventing your heating plant from absorbing heat from the fuel you pay for!

You can get your boiler cleaned by men who specialize in that work, or you can do it yourself if you're ambitious, and if you don't mind getting dirty. Stiff brushes will do the trick if you do the job yourself. The men who make a business of this work often use a special type of vacuum cleaner. Ask your regular heating man about the job.

Incidentally, although it seems strange, your heating plant will use too much fuel if it is too small for your house. There are a few instances of undersize furnaces being installed in homes. If you're having hard-to-find heating trouble the size factor may have something to do with it, although in most cases the cause is simpler.

Look the heating plant over for air leaks. Unsealed cracks either let air in to "cool off" the fire, or let heat escape. If you find any leaks between the sections of your heating plant, seal them up. There are several varieties of asbestos cement made especially for this purpose.

Look also for heat being wasted up the chimney. Your heating man or fuel dealer will doubtless be able to tell you if the gases going up the stack are too hot. If they are, you can install a simple automatic draft regulator. This is something of a technical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CLEANOUT DOOR LOOSE
UNINSULATED ATTIC
EXPANSION TANK FAULTS
TANK TOO SMALL
NO VERTICAL VENT (CAUSES SYPHONING)
NO WATER LEVEL GAUGE GLASS PROVIDED
THIS TYPE OF WATER HEATER INEFFICIENT & EXPENSIVE TO OPERATE
LOOSE JOINTS BETWEEN SECTIONS DUE TO FURNACE CEMENT BECOMING DISLODGED, OR SECTIONS NOT INSTALLED IN PROPER SEQUENCE, CAUSE HOT GAS TO BE BY-PASSED PREMATURELY TO CHIMNEY
BEDROOMS UNCOMFORTABLY HOT IN SUMMER BECAUSE :-
(A) NO INSULATION IN ATTIC
(B) NO INSULATION ON WALLS
(C) NO AWNINGS OR WINDOWS
LACK OF INSULATION ALSO MAKES IT HARD TO HEAT THESE ROOMS IN WINTER
LARGE CRACKS AROUND WINDOWS, LACK OF STORM WINDOWS AND WEATHER-STRIPPING, CAUSE EXCESSIVE INFILTRATION OF COLD AIR IN WINTER, RESULTING IN HIGH FUEL BILLS.
WALLS IMPROPERLY INSULATED AND HAVING NUMEROUS CRACKS & CREVICES, CAUSE WASTE OF HEAT.
COMMON CAUSES OF TROUBLE WITH HOT WATER RADIATORS
1. RADIATOR CAPACITY NOT BALANCED WITH HEATING REQUIREMENTS OF ROOM. ACCUMULATIONS OF DIRT, FLUFF, & GREASE ON INSIDE RADIATOR LOCATED IN INSIDE WALL MAY CAUSE DRAFTS OF COLD AIR TO CIRCULATE ACROSS FLOOR FROM OUTSIDE WALL RADIATORS SHOULD PREFERABLY BE LOCATED AT WINDOWS.
2. RADIATOR MAY BE "AIR BOUND" THIS MAY BE DUE TO THE AIR-VENT TUBE BEING OUT OF ORDER, LOCATED WRONG, OR NOT OPERATED WHEN NECESSARY.
3. ORNAMENTAL RADIATOR GRILLES OF POOR DESIGN SOMETIMES BLOCK OFF TOO MUCH OF THE HEAT OF THE RADIATOR.
IMPROPER PIPING
4. NUMEROUS SHARP BENDS RETARD CIRCULATION. USE 45° INSTEAD OF 90° ELBOWS.
5. RISERS SHOULD BE TAKEN OFF TOP OF MAINS FOR FIRST FLOOR RADIATORS, AND NOT SIDE (EXCEPT IN THE CASE OF A VERY LARGE RADIATOR WHICH IS NEARLY DIRECTLY ABOVE THE HEATER) AND WHERE THE MAIN IS REDUCED IN SIZE JUST BEYOND A 2ND FLOOR RISER.
6. MAINS SHOULD BE INSULATED AND SHOULD SLOPE UPWARD AWAY FROM HEATER. ALSO, AS RISERS ARE TAKEN OFF, THE MAINS SHOULD BE REDUCED IN SIZE.
7. RISERS TO SECOND FLOOR RADIATORS SHOULD BE TAKEN OFF SIDE OF MAIN, NOT OFF TOP, EXCEPT WHEN THE RISER OCCURS JUST BEFORE A REDUCTION IN THE SIZE OF THE MAIN.
8. WHERE A RISER IS TO BE CONTINUED UP BEYOND A RADIATOR, THE UPPER EXTENSION SHOULD BE TAKEN OFF LIKE THIS
9. MAINS TOO SMALL IN SIZE.
ALSO :-
THE ENDS OF ALL PIPES SHOULD BE REAMED. THIS REMOVES BURRS & PROMOTES EASIER WATER CIRCULATION.
ALL HIGH SPOTS WHERE AIR CAN ACCUMULATE IN PIPES SHOULD BE VENTED.

job, however, and is best done by someone familiar with the work.

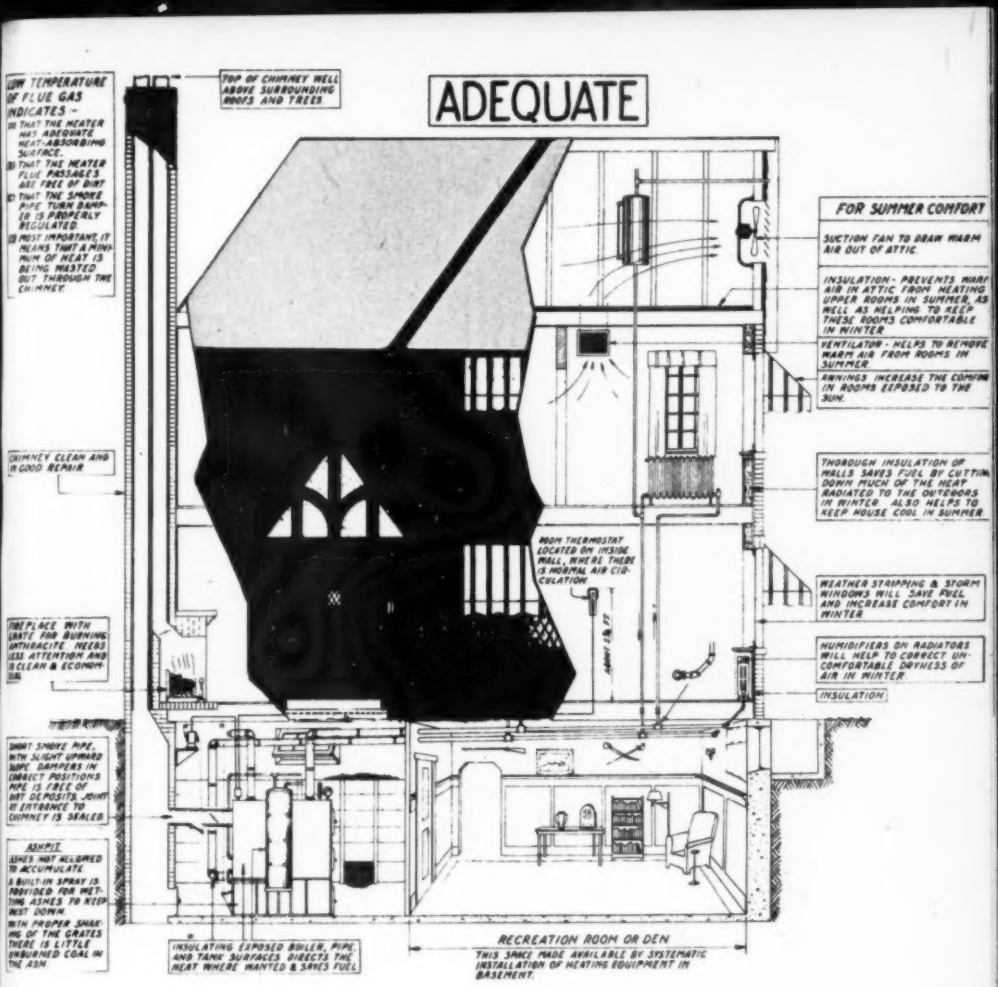
The combustion chamber of your heating plant might be greatly improved in its efficiency by a little rebuilding. Sometimes a baffle can be installed to keep the hot gases in the chamber a little bit longer—to give up more of their heat to the boiler. Here again, it will pay you to ask the heating man. He's had experience with this little heat-saving stunt, and he'll know whether your outfit needs it. He'll also know how to adapt the job to your boiler.

Some older type oil burners may now be equipped with new type "air mixers." Sometimes this saves as much as 20% on fuel consumption. Maybe one is available for your burner. It may pay you to find out.

Have your service man go over the nozzle of your burner. Its size and angle have a pronounced effect on the efficiency of your burner. And while he's at it he can check up on the ignition system that ignites the oil when your burner starts up. It should do its job quickly—before unnecessary fuel escapes unburned.

It isn't a bad idea to have him go over the oil lines and their filters and strainers. He may decide that the tank needs cleaning too. It'll save you money in the long run, to keep the fuel system clean. Your burner will do a better heating job when the oil is good and clean because any stoppage in the oil line upsets the balance between fuel and air.

If you hear a lot of "frying" going on inside the heating plant after the burner shuts off,


ADEQUATE
LOW TEMPERATURE OF FLUE GAS INDICATES -
(1) THAT THE HEATER HAS ADEQUATE HEAT-ABSORBING SURFACE.
(2) THAT THE HEATER FLUE PASSAGES ARE FREE OF DIRT
(3) THAT THE SMOKE PIPE DAMPER IS PROPERLY REGULATED
(4) MOST IMPORTANT, IT MEANS THAT A MINIMUM OF HEAT IS BEING WASTED OUT THROUGH THE CHIMNEY.
TOP OF CHIMNEY WELL ABOVE SURROUNDING ROOFS AND TREES
FOR SUMMER COMFORT
SUCTION FAN TO DRAW WARM AIR OUT OF ATTIC
INSULATION - PREVENTS HEAT IN ATTIC FROM HEATING UPPER ROOMS IN SUMMER, AS WELL AS HELPING TO KEEP THESE ROOMS COMFORTABLE IN WINTER
VENTILATOR - HELPS TO REMOVE WARM AIR FROM ROOMS IN SUMMER
AWNINGS INCREASE THE COMFORT IN ROOMS EXPOSED TO THE SUN.
CHIMNEY CLEAN AND IN GOOD REPAIR
THOROUGH INSULATION OF WALLS SAVES FUEL BY CUTTING DOWN MUCH OF THE HEAT RADIATED TO THE OUTDOORS IN WINTER. ALSO HELPS TO KEEP HOUSE COOL IN SUMMER
ROOM THERMOSTAT LOCATED ON INSIDE WALL, WHERE THERE IS NORMAL AIR CIRCULATION
WEATHER STRIPPING & STORM WINDOWS WILL SAVE FUEL AND INCREASE COMFORT IN WINTER
FIREPLACE WITH GRATE FOR BURNING ANTHRACITE NEEDS LESS ATTENTION AND IS CLEAN & ECONOMICAL
HUMIDIFIERS ON RADIATORS WILL HELP TO CORRECT UNCOMFORTABLE DRYNESS OF AIR IN WINTER
INSULATION
SMOKE PIPE WITH SLIGHT UPWARD SLOPE. DAMPERS IN CORRECT POSITIONS. PIPE IS FREE OF SOOT DEPOSITS. JOINT AT ENTRANCE TO CHIMNEY IS SEALED
ASH PIT
ASHES NOT ALLOWED TO ACCUMULATE
A BUILT-IN SPRAY IS PROVIDED FOR WETTING ASHES TO KEEP DUST DOWN
WITH PROPER SHAKING OF THE GRATES THERE IS LITTLE UNBURNED COAL IN THE ASH
INSULATING EXPOSED BOILER, PIPE, AND TANK SURFACES DIRECTS THE HEAT WHERE WANTED & SAVES FUEL
RECREATION ROOM OR DEN
THIS SPACE MADE AVAILABLE BY SYSTEMATIC INSTALLATION OF HEATING EQUIPMENT IN BASEMENT.

perhaps a leaky oil valve is the cause. This wastes fuel if it isn't repaired.

Should you change from one grade of oil to another be sure to have your burner adjusted accordingly. If you don't, you'll be wasting fuel.

If you happen to have an automatic coal burning unit in your home, keep a fairly deep fire bed. Some home owners with this type of equipment have the idea that it's economy to keep a small fire bed. The exact opposite is true. Also make sure that the coal is being fed to the heating plant at the proper rate. Have the rate adjusted to the amount actually required. Changing the type of fuel used in these units also calls for a little readjusting of the unit—the same as in an oil burner. That's the only way to be sure of top efficiency. The "hold fire" control of an automatic stoker should also be adjusted to burn the minimum amount of fuel while it is in operation. If this is done correctly it can effect considerable savings.

If you have a hand fired coal burning system, you'll have to keep in mind a few more details than the owners of the automatic outfits. But you can operate them very economically when you know how. At least you can eliminate any practices that may have been wasting your coal.

First off, keep the ash pit clean and the fire box full. And don't wet your coal before burning it. It takes heat to evaporate that water before the coal will burn—and that's simply heat that doesn't do much to help keep your house warm. Keep the turn damper

When all else fails you can always resort to one of these efficient heating methods. *Above* is a combination furnace, water aeriator and beer tap, built into the old upright by Home Workshopper Derringer B. Druddle. Though Mr. Druddle's arms seem to be working at cross purposes, he actually has everything under control. At *right* is shown a time-honored but still useful, and withal, inexpensive way of keeping Old Man Frost at bay. When you get to this point, burn the house down and go South for the winter.

nearly closed, and don't use it to regulate the fire for daily changes in temperature. The check and ash pit dampers are used for the latter purpose.

A reasonable depth of ashes in the grate will help to hold the fire. Incidentally, don't get the habit of using the fire door and ash pit door as means to regulate the fire. Likewise, resist the temptation to be a "poker"—punching holes in the fire, and constantly fooling with the furnace. And don't shake the fire to pieces. Shake it when it's necessary to admit fresh coal—and stop shaking it when the red glow appears in the ash pit. Burn the correct size coal, and don't use the furnace as an incinerator to burn up garbage or rubbish.

If for any reason, the furnace seems to be lacking sufficient draft, check up on the chimney and the pipe leading from the furnace to the chimney. Either soot or some obstruction, such as a piece of dislodged masonry, may be blocking it.

Upstairs in the rooms, it's a wise idea to provide a means for maintaining the proper humidity. Special water containers may easily be fitted to the radiators to take care of this. (You've probably seen the pot of water that's usually placed on the old-fashioned stove in a country store, for this purpose.)

On all types of heating systems, be sure that the insulation of the heating unit and the pipes (or air ducts) is intact. That way more heat reaches the rooms it's intended to keep warm. And you'll find that ordinary oil paint to match the decorative scheme of the room, is about the best thing to use on radiators. The bronze or aluminum paint sometimes used wastes heat. Lower the temperature of the house at night when you don't need much heat, and if you go away for a week-end you needn't keep the temperature much above 50. That'll keep things from freezing. With automatic oil burners such temperature control is quite simple. It's also a good idea to close off unused rooms, keeping their doors shut, and their heat turned off. Sun porches are hard to heat because of the large area of glass. Unless these are equipped with double sashes it's wise to shut them off from the house for heating economy.

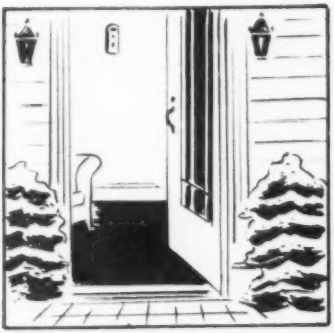
At night when [*Continued on page* 154]

Left: If you go away for the weekend, turn down the heat—to about 50, and be sure all doors and windows are closed.

Right: Don't wash dishes in hot running water. Use a dish pan and you won't waste heat. And hot water carries away lots of valuable heat.

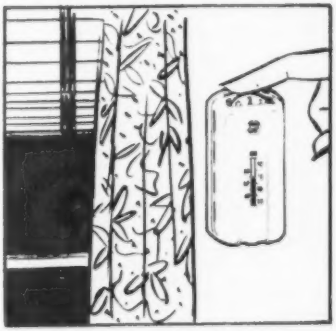
Left: You won't have to keep the room so warm if you sit by a radiator to do your evening reading. You'll be more comfortable there too.

Right: Don't leave doors open in the cold weather. It wastes plenty of heat as warmed air of house escapes and cold enters.



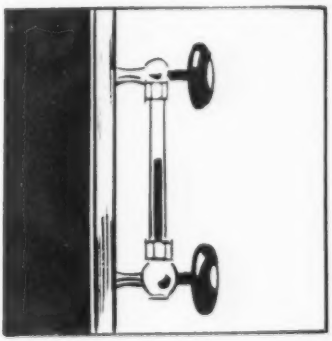
Left: Use your fireplace when you want to—but close damper when it's not in use. Then warm air won't escape up the chimney, wasting fuel.

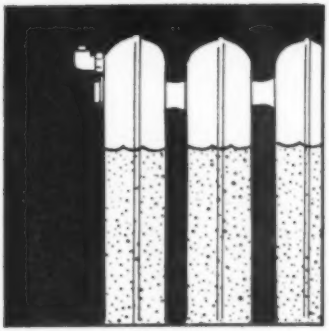
Right: If your thermostat is too close to a window or outside door it may "feel cold" before the room does. Re-locate it properly.



Left: When you wash your hands put the stopper in the basin. You'll save fuel every time you use hot water *economically*.

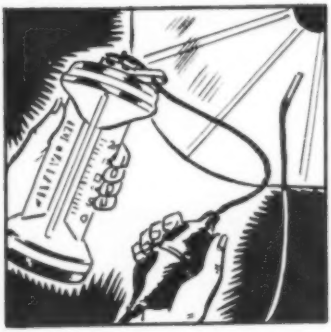
Right: Look at the water gauge on your boiler. Keep it at the correct level. This is something many home owners overlook. It's not hard to do, so keep it right.





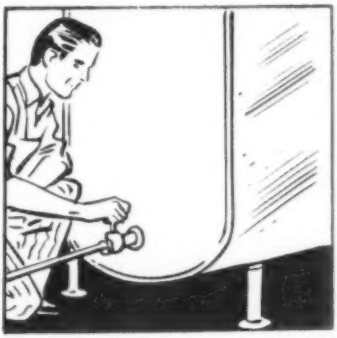
Left: Be sure to let the air out of the top of hot water radiators or you won't get the most out of the fuel you burn up in furnace.

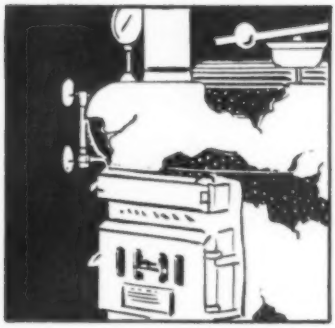
Right: Your heating man can adjust the air on your burner—and also make adjustments needed if you change the type of oil used.



Left: Your service man can also tell whether your heating unit is burning its fuel efficiently. A special instrument tells all of it.

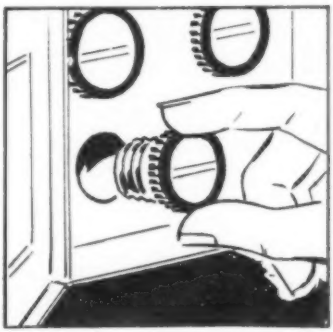
Right: The oil lines should be checked over and kept clean. Stoppages in line or strainer can upset balance of fuel and air burned.

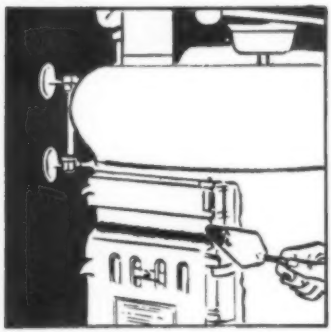




Left: If your furnace looks like this you're wasting fuel. Repair the insulation, and you'll effect cash and fuel savings. Try it today.

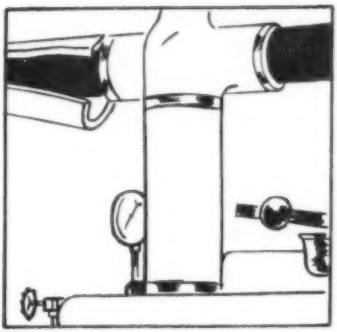
Right: Find out which fuse is the one that carries current to your oil burner. You may want to replace it in a hurry almost any time.



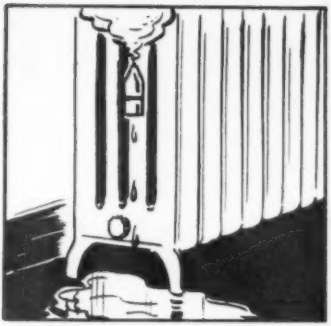


Left: Cracks around doors of furnaces converted to oil should be sealed with asbestos cement as shown. It's easy to do and wise.

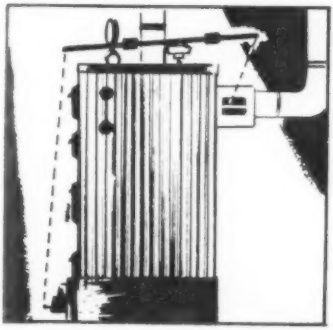
Right: If insulation is falling off pipes or air ducts, put it back again. If it needs replacing in spots, do it and save your fuel.



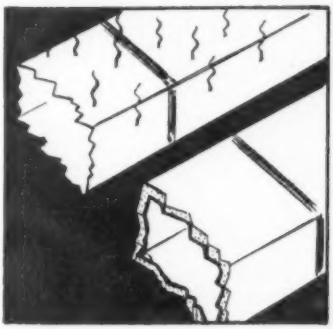
Left: Weather stripping is easy to apply and it saves fuel by keeping warm air in the house and keeping cold air outside. Do you need it?



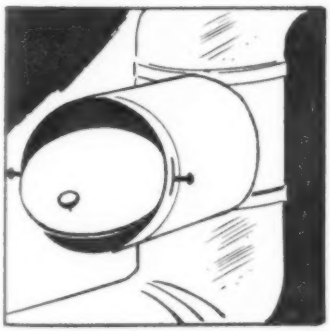
Right: If you have any leaky radiators like this one get them repaired. Leaks waste heat and fuel, too. Repair is a simple job. Get it done.



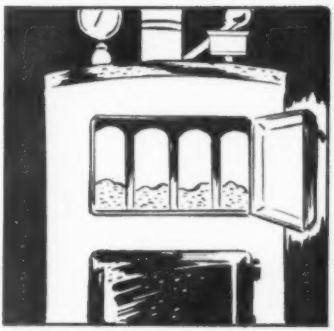
Left: Automatic regulators will save fuel for you on coal burning systems. Ask your heating man about them. It may pay you very well.



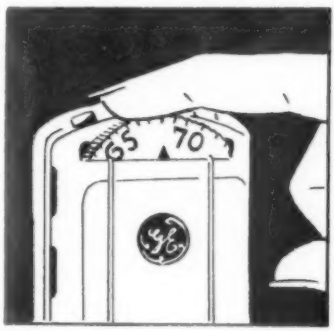
Right: You'll get more economical heating from your hot air system if the ducts are properly insulated. Make certain that they are.



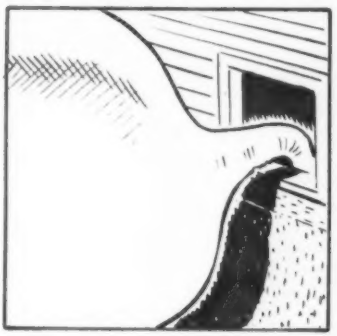
Left: This is what an automatic draft regulator looks like. Ask your heating man if you could save fuel with one. He will know.



Right: Get the soot and fly ash out of your heating system. A coating of this stuff is like a coating of concrete. It wastes plenty of fuel.



Left: Turn down the heat when you go to bed. It'll save fuel for you—and you'll probably sleep better besides. A thermostat clock can do it for you.



Right: This big balloon-like bag is getting full of soot from a furnace cleaner's vacuum. When the system is clean it's economical in operation.

The "spirit match" trick. An innocent bystander is handed a matchbox which soon gives out spirit raps.

Magic

Baffle friend and foe alike with these "supernatural" effects.

by Ken Murray

ALL people find it entertaining to be mystified and if you go a step farther, allowing them a glance into the supernormal, they are easily convinced that you are possessed of occult powers beyond mortal reckoning. Bear in mind that the three "tricks" explained here are *exceedingly* simple and easy to do, but if you present them with a small measure of showmanship four out of five in your audience will actually believe that they have seen a supernatural demonstration.

The first two effects make use of a *modus operandi* that will not once be thought of by spectators. The explanation is here revealed for the first time; even few professional magicians in the United States know of it.

Left: The pellet containing the name of a living person moves about merrily while the other pellets remain obediently quiet.

Effect No. 1

The performer borrows an ordinary, unprepared box of penny matches and empties the contents on a table. He carefully searches among the matches and finally chooses one which he holds up for all to see. This, he explains, is a spirit match. The spirit match is cautiously dropped into the match box and

Here's the secret of the moving pellet: A Mexican jumping bean is wrapped in the paper having on it the name of a living person.

for the Millions

Right: In a preliminary demonstration the chalk writes a "spirit" answer to an oral question asked by a spectator.

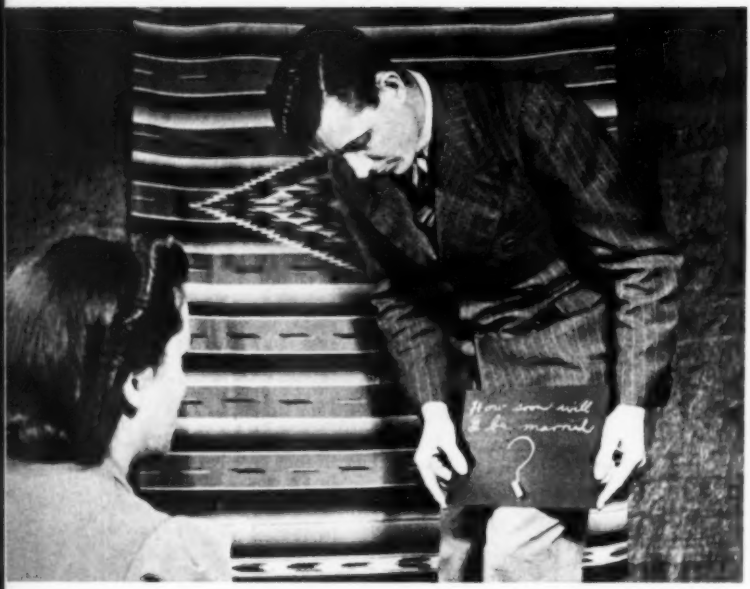
the drawer is closed. A spectator—any spectator who is not of a highly nervous disposition and therefore not given to fainting easily—is asked to take the box and hold it to his or her ear. This is done at any distance from the performer. Within a few moments the spectator hears a distinct "spirit" rap issuing from inside the box. The rap is repeated several times, loudly enough for others to hear. Finally the performer receives back the box, removes the match and permits both to be examined.

Effect No. 2

A number of slips of paper are passed and spectators are asked to write on each the name of a deceased person. One more slip is given to any spectator who is instructed to write thereon the name of a person who is very much alive. Each slip is crumpled into a small pellet, all pellets are dropped together on a table. Standing at any distance the performer now makes mysterious passes toward the crumpled slips and finally one is seen to move slightly. It moves again and again, sometimes falling from the table, so energetic is the action. The pellet is unrolled and on the paper is found the name of the living person.

You have read an accurate description of

A spectator is then asked to take the chalk and write a question (non-political, please) on the black cardboard.

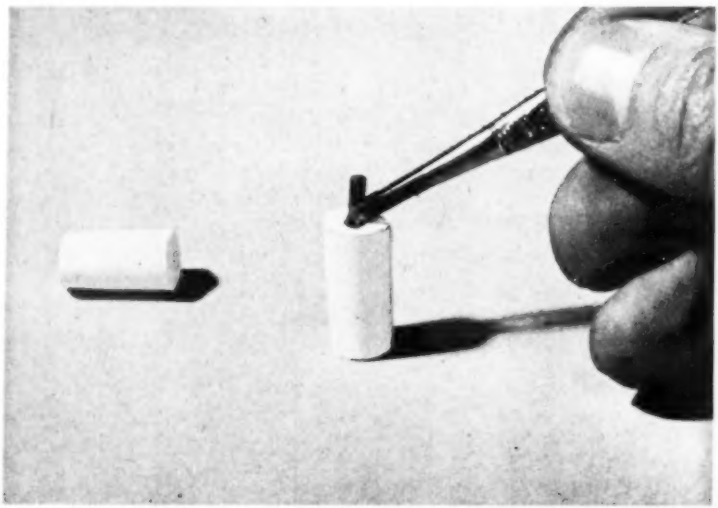


The chalk writes the answer to the question written by the spectator. Actually, the chalk is held stationary by a magnet in the performer's pocket; he moves the black card.

the two effects. How are they accomplished? Any audience will be even more puzzled on witnessing the actual demonstration.

The effects should not be judged eeffete because the explanation is simple. The "motive power" made use of in each case is a tiny but very active "Mexican jumping bean," which is really a nut inside of which is a live worm. Antics of the worm in trying to make an exit from the "bean" cause the latter to jump about merrily. In each case the "bean" is clipped between two fingers so as to be unseen. In effect No. 1 it may be slipped into the box after the latter is first emptied, or it may be dropped in with the single match. It is secreted when the match is removed. In effect: No. 2 the bean is wrapped inside the "alive" pellet. The performer removes it as he unrolls the slip of paper.

The secret of making best use of the Mexican Jumping Bean is to warm it in the hand for a short time [*Continued on page* 168]



Embedding a piece of soft iron in chalk so that it will be attracted by a magnet.

Pear-Mallet for Kitchen

The completed kitchen mallet. It can be used in a score of ways.

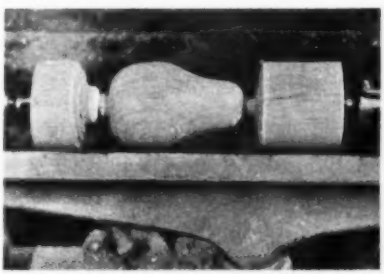
Left: Turning mallet handle. After sanding, wood is polished by holding turnings against it. *Above:* After being tapped lightly with the pear-shaped mallet, this coffee-can lid is easily unscrewed.

DESIGNED primarily for loosening stubborn jar lids by light tapping—which is just about the most effective way—this pear-shaped wooden mallet, hanging in a metal clip riveted to a decorative wall plate, will be found handy for a dozen other kitchen chores.

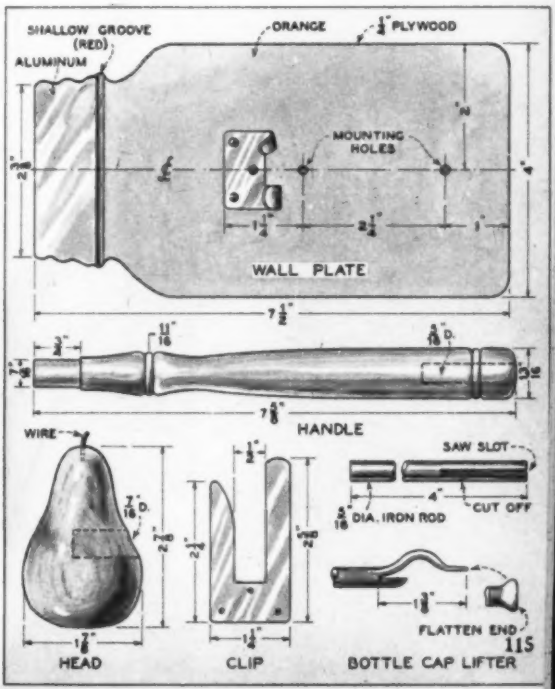
Turn the handle and head from hardwood to dimensions indicated, and bore the head to receive the glue-coated end of the handle. The mallet is pear-shaped; and as a touch of realism you may add a stem made from a piece of brown electric wire. Finish the wood with clear or colored lacquer.

In the large end of the handle is a bottle cap lifter made from a 4" length of $\frac{5}{16}$" tool steel rod. Saw a slot in the rod for 1¾", cut one of the resulting halves off and shape with a file to form a $\frac{7}{16}$" tongue. Heat the other half red-hot, hammer the end flat, and bend to the shape shown. Temper by heating the steel to a cherry red, plunging it into cold water, heating again until a bright spot filed on the metal turns blue, and again cooling in water. Polish the metal and apply clear or colored lacquer. Bore the handle to a depth of 2⅜" and insert the rod, using plastic adhesive to anchor it. A worn-out round file may furnish material for the lifter.

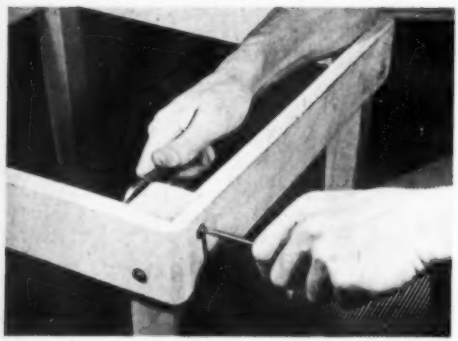
From ¼" plywood or pressed composition wood, jigsaw the wall plate, which is shaped like a fruit jar. Make a shallow groove to separate the lid part from the jar. Paint as indicated, or in your own scheme. Drill and countersink two holes to [*Continued on page 172*]



The pear-shaped mallet head is turned from a hardwood cylinder. At the stage shown, the work can be removed from the lathe and the handle hole bored; the attached ends make it easier to hold.



PLAYROOM FURNITURE



Corner construction of table is simple but sturdy, and neat in appearance. *Below:* Method of tapering legs with jack plane.

by Charles and Bertram Brownold

OF ALL the Christmas presents that can be given to a little child, a pretty set of furniture of his very own, made expressly for him, is one of the most welcome. Not only will it surprise and delight him on Christmas morning, but it will afford more lasting pleasure than a toy he may soon tire of, or break.

The making of children's furniture is just about the pleasantest, and easiest work to which the craftsman can turn his hand, and one that affords the maximum in satisfaction. For when the work is finished he has something that is good looking and useful.

The expense is so low that it can be an almost negligible factor in his planning, for most of the parts of the small furniture are so small that they can be made of scrap lumber.

It so happens that an interesting situation exists in respect to children's furniture that provides the craftsman with a golden opportunity for the exercise of his skill and the

Table and chairs are designed at correct proportional heights to give comfort and convenience to the young children.

pursuit of his hobby. The situation arises out of the fact that much of the children's furniture on sale in the stores is far heavier, costlier, of better material, and better made than it need be in view of the short period of time during which it can be useful. For children outgrow small furniture so rapidly that this "too-good" furniture is still in excellent condition long after they are too big for it. The reason why it is so needlessly well made is that it is turned out by the same factories that manufacture full-sized furniture designed to last adults a lifetime. When the manufacturer makes children's furniture he finds it more profitable to use the same production methods and manufacturing processes than to re-design his plant.

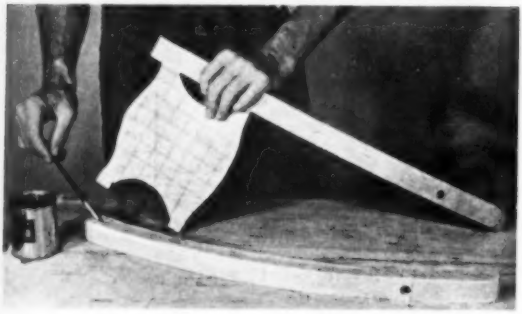
The cost of this excellent furniture is quite as high as its fine quality would lead one to expect.

Children's furniture is frequently squatter and "stubbier" in appearance than full-sized furniture. The reason for this is that its base is usually larger in relation to height than is the case in furniture for grown-ups. The larger the base the less danger of tipping and possible injury to little ones.

When children outgrow furniture that is still in good condition it must be given away (not without a sentimental pang!) or sold for whatever small sum it will bring, or stored for the next generation. But in the present

The large plywood table top is fastened to the frame by screws, with heads slightly countersunk. *Below:* Smaller top is glued to large one, with clamps holding it down around the edges, while a pail of water provides weight in center.

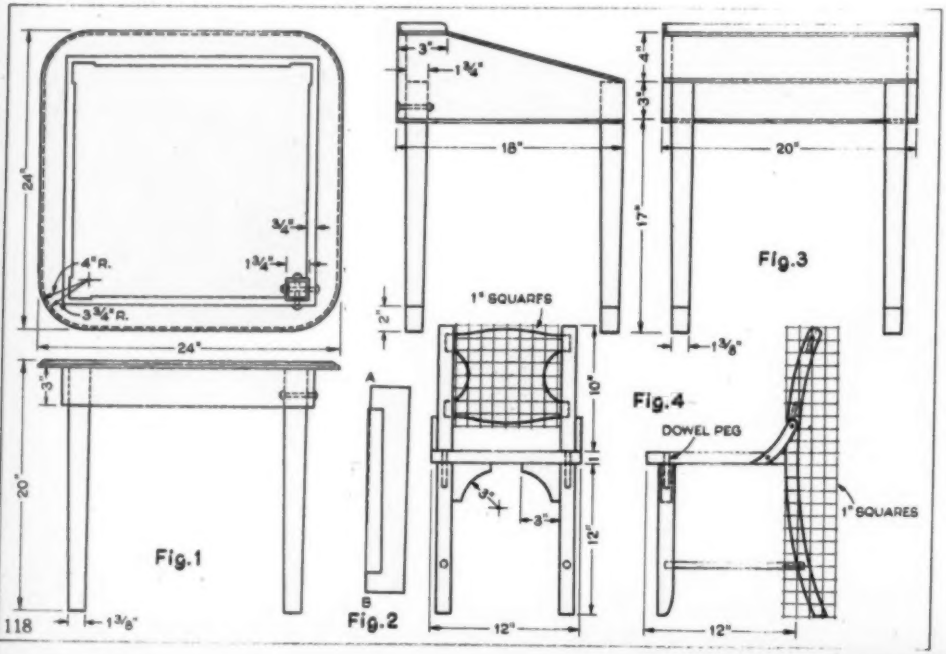
Dowel pegs attach front legs to seat. Note corner braces. *Below:* Plywood back is tenoned and casein-glued into back legs.



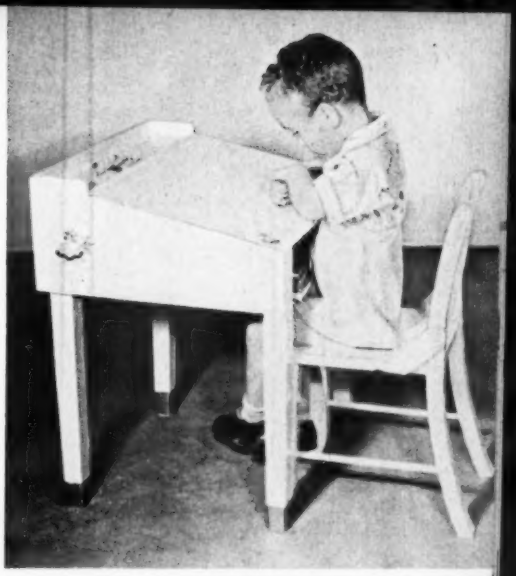
Final assembly of chair discloses a sturdy, good looking, well-made article of child's furniture.

day of compact living quarters there rarely is "a cradle in the attic" for so many of us have no attics.

In addition to the *good* children's furniture on sale in stores, there also is a grade on sale that is so flimsily constructed and so easily broken that its use constitutes a real danger to little children.

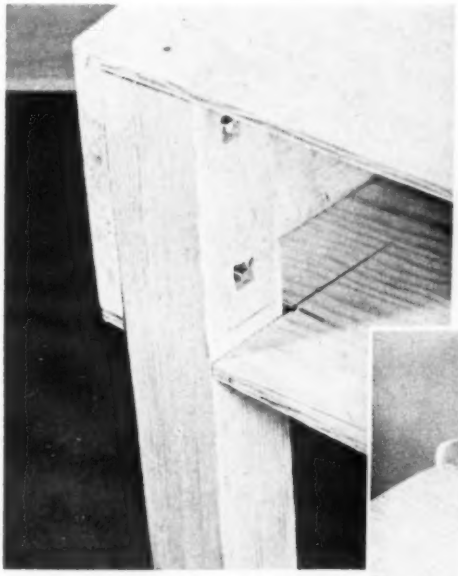


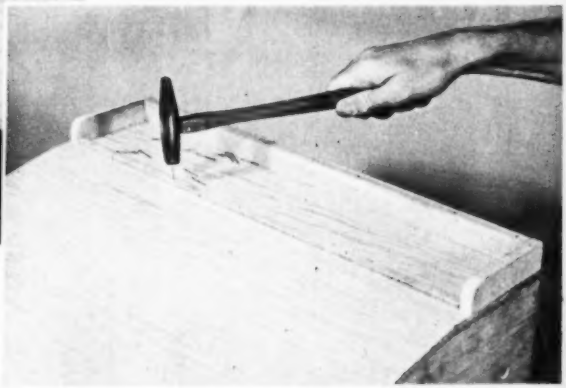
Painted and decorated with decals, the desk has ample work space for Junior, his books and his pencils.



It is at this point that the craftsman's opportunity becomes apparent. Even if he is possessed of only elementary skill at carpentry he can turn out children's furniture of ample sturdiness. Moreover, with an exceedingly small outlay for paint and decoration he can make it the equal in appearance, if not the superior, of much of the store furniture.

The photos herewith show a table, a desk, and two chairs. The chairs are identical, so that plans for only three pieces are needed. The cost of the wood of which these three pieces are made was $2.74. See the Table of Costs herewith, which has been figured to the nearest foot. This cost has been worked out on the assumption that it will be necessary to buy *all* of the wood, while as a matter of fact the average craftsman will be able to find most of what he needs in his own wood pile.





Above: Corner construction of desk, showing rigid assembly between leg, top, side and shelf. *Right:* Finishing nails hold strip in place.

the majority of the parts being so very small.

The cost of painting the three pieces described is very low. A quart of good paint covers 150 square feet. The three pieces have a painted area of approximately 22 square feet, exclusive of under-surfaces which need not be painted.

Nobody will need much instruction on how to build this furniture as the construction is so simple that the drawings and photos tell the story. A little explanation, however, may be useful in saving possible waste motions.

The Table. Glue and bolt the four tapered legs into the corners of a square wooden frame as shown in Fig. 1, allowing the glue to dry and harden while under pressure from the bolts. If the tapered legs are planed by hand, a handy way to perform the operation is to set the untapered part of the leg in a bench vise with its other end resting on a cleat nailed across the bench in such a manner that its end projects over the edge of the bench. Held in this manner the leg can be turned so that all four sides can be planed one after the other.

If the tapering is done on a bench saw, nail the leg to a piece of scrap wood having parallel sides, in the position shown in Fig. 2. Set the ripping fence so that the piece of scrap wood will just fit between it and the blade and cut on line AB.

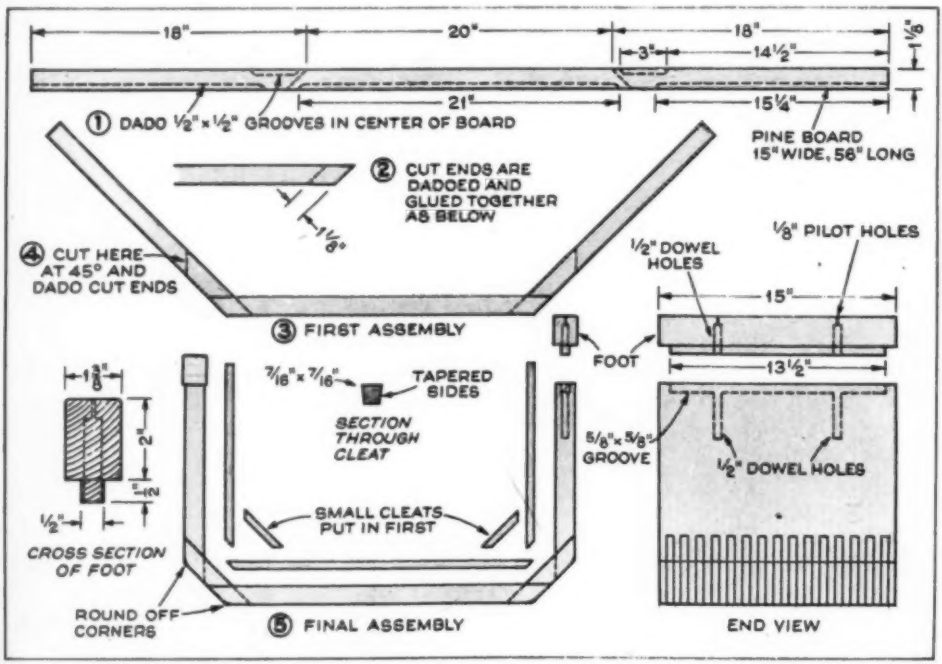
The top of the table is made of two pieces of ¼" plywood, super-imposed one upon the other. The bottom piece measures 24"x24" and the top piece measures 23½"x23½". The corners are rounded, and the edges are quarter-rounded on both pieces.

Center the frame (with the legs glued and bolted in place) on the under side of the larger piece of plywood and secure it in position with flathead screws countersunk flush with the upper surface of the plywood. Then center the smaller piece of plywood on the larger and glue it in place under pressure. By this means the screw heads are concealed, and the rounded edges of the table have a neat, routed appearance.

The Desk. The desk is a box with a sloping top and with an open front into which books, papers and etc. are placed. The legs are attached in a manner similar to that explained for the table.

The bottom of the desk is a piece of ¼" plywood with cut-out corners to accommodate the legs.

The top is also ¼" plywood. Nail the top firmy to the [*Continued on page* 154]



DEER FOOT LAMP

The four feet of a deer, elk or other hoofed game animal serve as the standard for this attractive sportsman's lamp. At *right* and *left* is the completed lamp, with and without the shade, which may be skin or parchment. *Below:* Applying a gimp-band. Two or three are used.

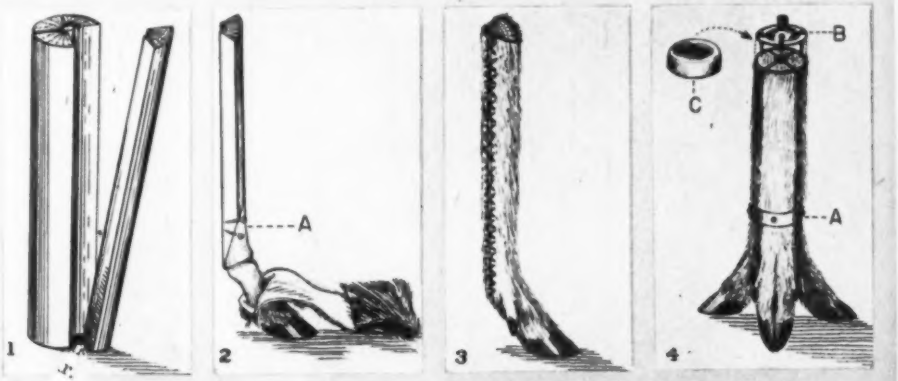
by John W. Moyer, *Staff Taxidermist, Field Museum of Natural History*

MOST attractive, and useful novelty lamp can be made from the four feet of deer, moose, elk etc., that are usually thrown away by the hunter after securing his trophy. This lamp will fit in well with all the early American furniture and is also the ideal lamp for a trophy room, or the summer home.

The cost of materials for making this lamp are very reasonable and can be secured from a reliable taxidermy supply house. The lamp is easy to make and by following the description, drawings and photographs, your first attempt will turn out as a fine piece of handicraft you will be proud of.

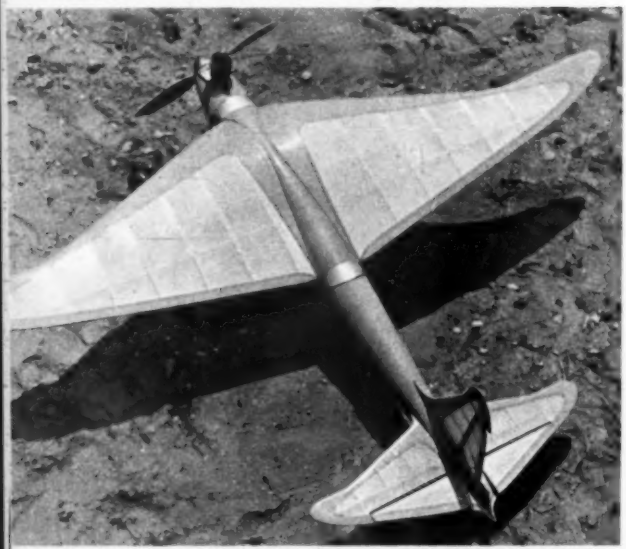
Secure the four feet of the animal while they are still fresh and separate the skin from the leg-bone by making a cut up the leg. Starting at the hoof, the cut should be made up the back of the leg leaving about 15 inches of the skin attached. In skinning out each leg, be sure to work the skin well down to the hoof. The dew-claws are cut away from the leg-bone and are left attached to the skin.

[*Continued on page* 170]



MANTA

Ample wing area plus the efficient airfoil chosen for the *Manta* give it both lift and speed to an amazing degree. Nevertheless, it lands no faster than a slow gas model.



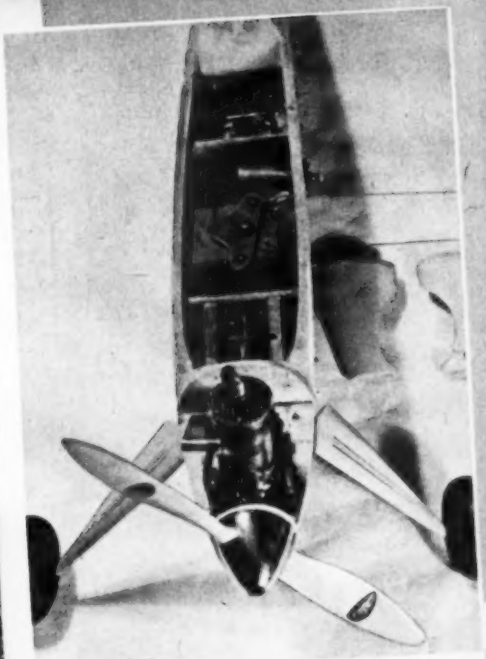
Combining unusual and beautiful design with high performance, this 75 m.p.h. "devil fish" plane will bring a new thrill to U-control fans.

HOW many of you tether control modelers have watched one of these speed demons split the air and then upon landing, somersault all over the field?

Well, here is the ship that is a model builder's dream.

It has a landing speed comparable to that of a regular gas model and a high speed of seventy-five miles per hour with regular fuel and a stock Cyclone engine.

"Nose-overs" are very rare, because of its special shock absorbing landing gear.

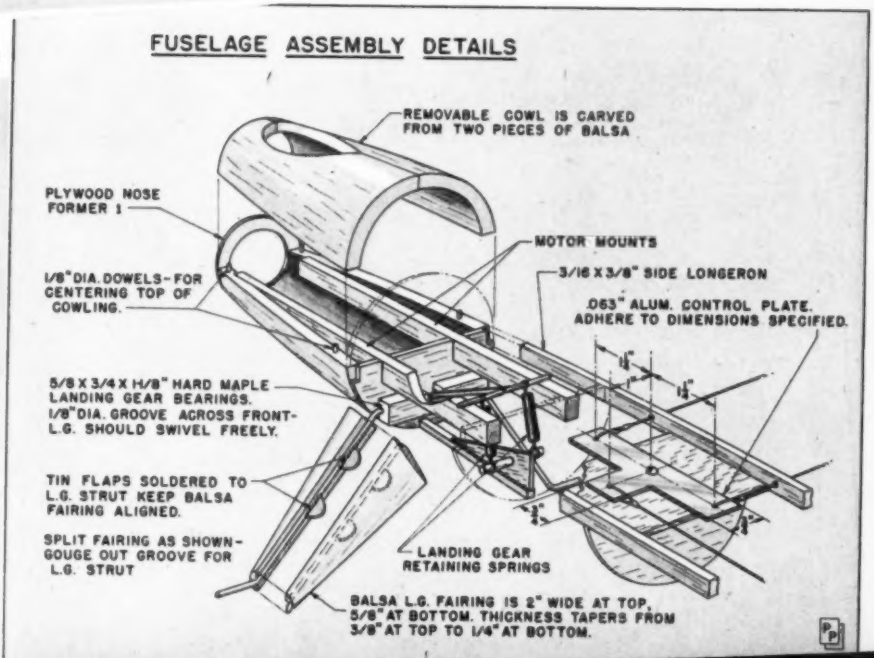


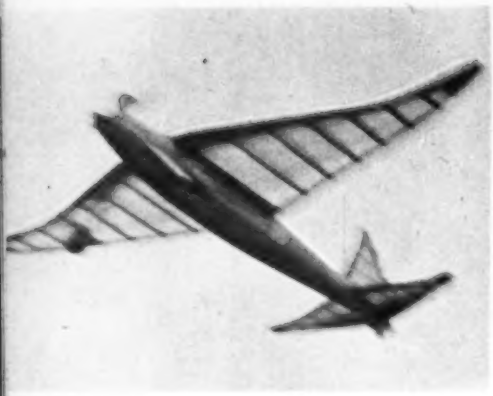
The elongated blur in the air over the "pilot's" head is the *Manta*, slamming along at realistic pursuit ship speed. At *right* is the top of the fuselage with the wing removed. Motor is a standard Cyclone.

Fighter Model Plane

by
Artie Gray

FUSELAGE ASSEMBLY DETAILS


REMOVABLE COWL IS CARVED FROM TWO PIECES OF BALSA
PLYWOOD NOSE FORMER 1
MOTOR MOUNTS
3/16 X 3/8" SIDE LONGERON
1/8" DIA. DOWELS - FOR CENTERING TOP OF COWLING.
.063" ALUM. CONTROL PLATE. ADHERE TO DIMENSIONS SPECIFIED.
5/8 X 3/4 X 11/8" HARD MAPLE LANDING GEAR BEARINGS. 1/8" DIA. GROOVE ACROSS FRONT - L.G. SHOULD SWIVEL FREELY.
TIN FLAPS SOLDERED TO L.G. STRUT KEEP BALSA FAIRING ALIGNED.
SPLIT FAIRING AS SHOWN - GOUGE OUT GROOVE FOR L.G. STRUT
LANDING GEAR RETAINING SPRINGS
BALSA L.G. FAIRING IS 2" WIDE AT TOP, 5/8" AT BOTTOM. THICKNESS TAPERS FROM 3/8" AT TOP TO 1/4" AT BOTTOM.



THE *MANTA* FIGHTER

One of the most promising aircraft designs of this war, the *Manta* long-range fighter was designed by David R. Davis, famous for his new, high-efficiency airfoil. Although specifications of the prototype are a military secret, speculation has it that the *Manta* spans 50 feet—a *big* airplane in the fighter class. Reason for its big size are the range and fire power, which will probably be long and heavy, respectively. Top speed may exceed 450 m.p.h., but tests alone will verify this figure, which will remain undisclosed, at least until the end of the War. Most unusual aspect of the new fighter is its highly tapered wing, expected to increase the efficiency of the already famous Davis wing section.

Assisting Davis in engineering work was William Waterhouse, who helped design the Lockheed P-38 *(Lightning)* and Charles Lindbergh's famous *Spirit of Saint Louis*. Two years of wind tunnel work were expended in the design, and only time will tell if the *Manta* will bear out the designer's, and Uncle Sam's hopes.

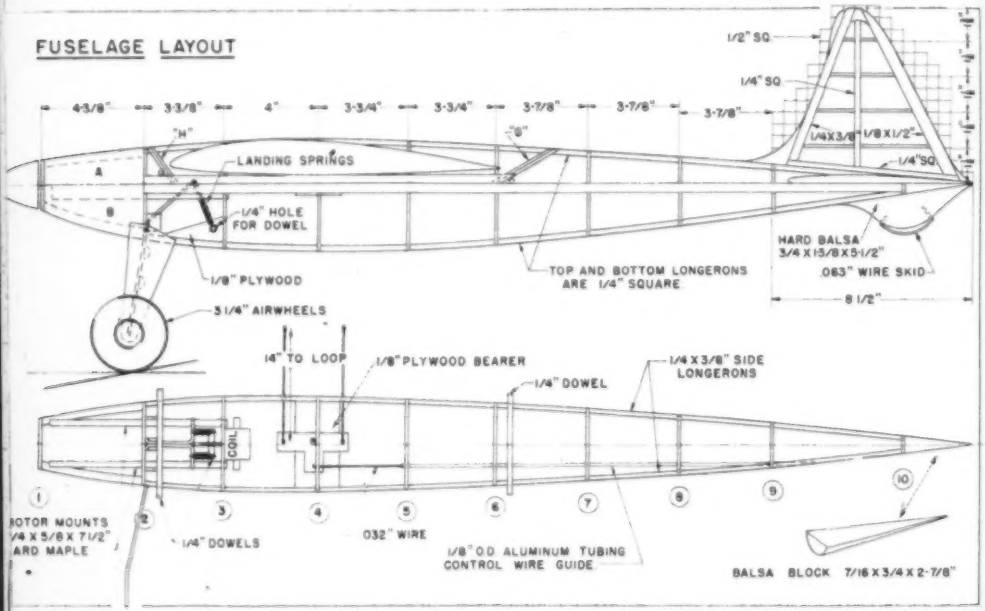
The ship is a real prize winner, and at a recent contest in Moorestown, South Jersey, the ship was flown in three events and took one first, and two second places.

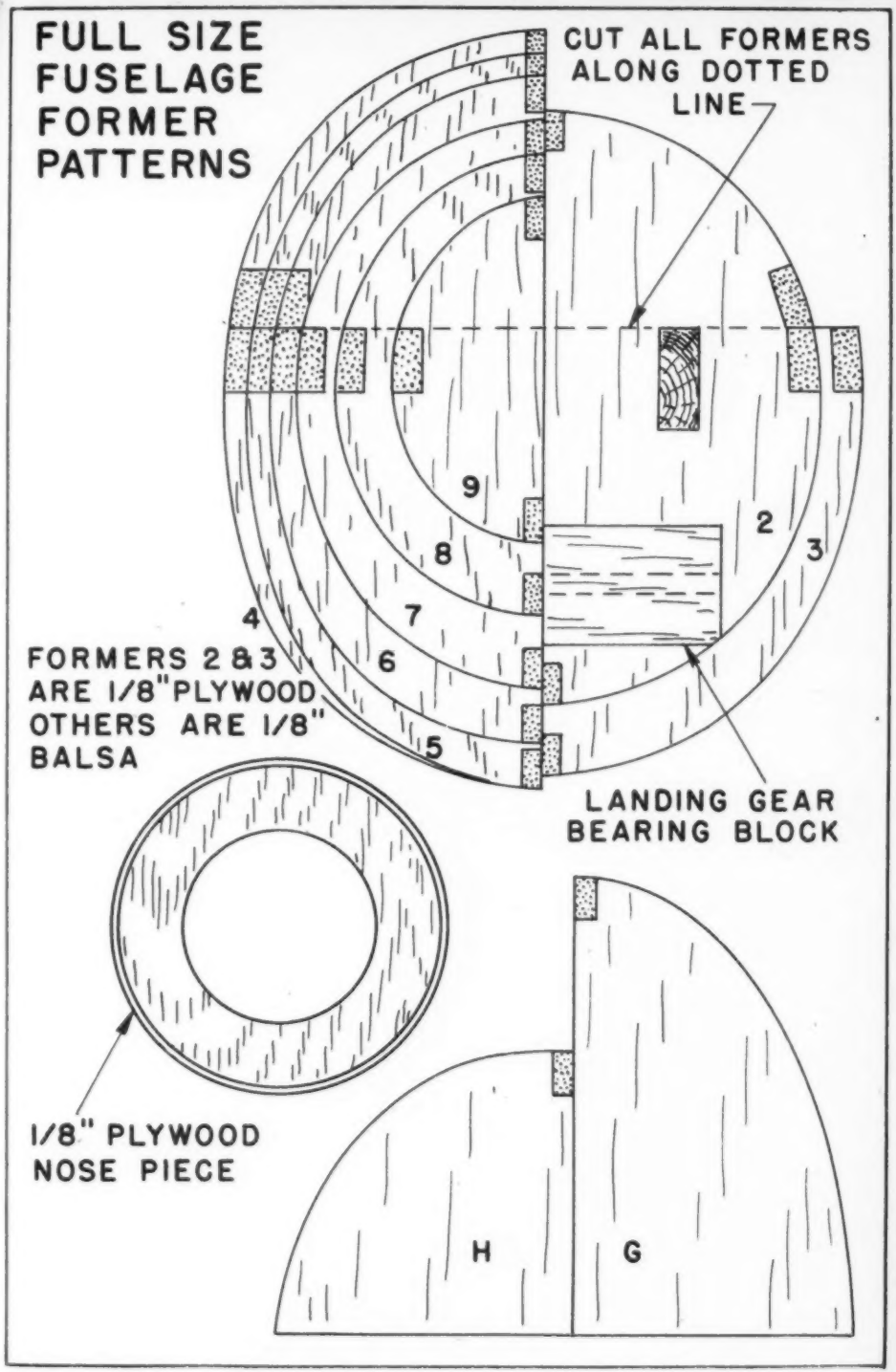
Building The *Manta* Model

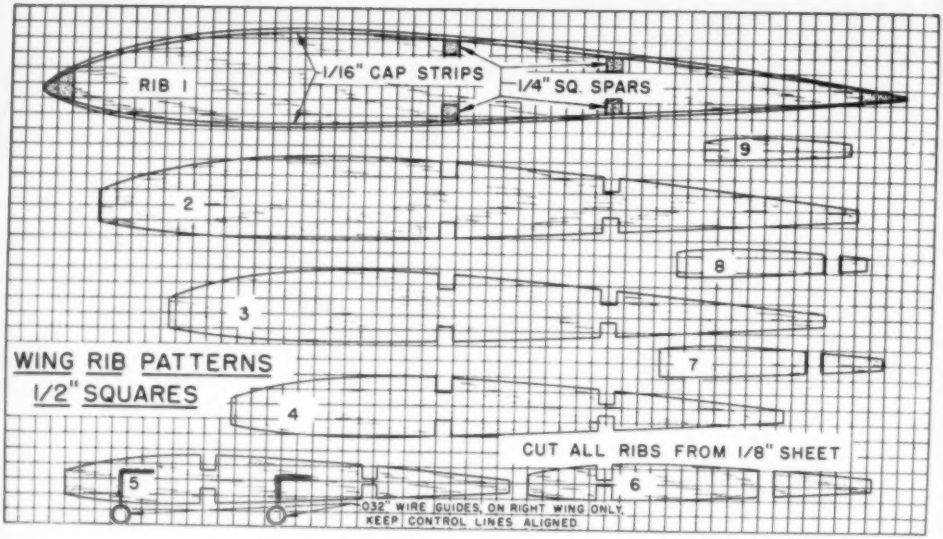
Based on the spectacular *Manta* fighter design, the model bears the same startling resemblance to the giant ray, or devil fish, but is not to be considered a scale model in any respect. Obviously, it would be impossible at the present time, to create a scale model of a ship being tested for the American Air Forces. On the other hand, this model is a real performer, and looks enough like the *Manta* to make it an interesting project for model fans who crave realistic appearance, as well as airworthiness, in their model planes.

Before starting construction enlarge the plans to full size and study carefully, as this is not a beginner's plane. Entire ship is made of medium hard balsa (pine or basswood, if you can't get balsa), except for the planking, the nose, and the tail blocks. Plans

Photo at *top* shows the model in full flight. A camera shutter speed of 1/300 sec. proved not fast enough to stop action. The unique landing gear shown in the drawing *below* bends back about 3 inches if the wheels strike an obstruction, preventing nose-overs. Formers on *opposite page* are full-sized.




FULL SIZE FUSELAGE FORMER PATTERNS
CUT ALL FORMERS ALONG DOTTED LINE
9
8
7
6
5
4
2
3
FORMERS 2 & 3 ARE 1/8" PLYWOOD OTHERS ARE 1/8" BALSA
LANDING GEAR BEARING BLOCK
1/8" PLYWOOD NOSE PIECE
H
G



are made as self-explanatory as possible.

Fuselage And Landing Gear

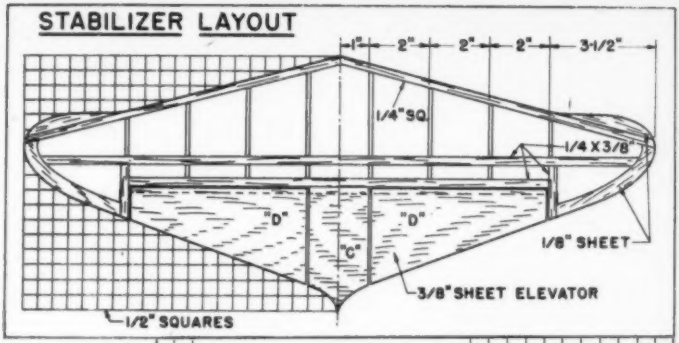
Lay $\frac{3}{16}$"x$\frac{3}{8}$" longerons on top view of the plans and glue bottom part of the bulkheads to them. Before gluing bulkhead No. 2 in place, make the landing gear and hold to the bulkhead by cementing a hard maple bearing

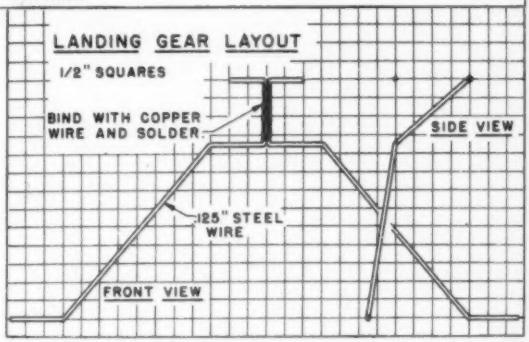
Ready for the takeoff. Note wing clip by the hand of the man holding the model. Drawing at top shows wing ribs, which should be duplicated full-size on paper before cutting out from sheet balsa.

on place indicated. Be sure the landing gear moves freely in the bearings.

Now add ¼"x¼" bottom longeron and plank this much of the fuselage with ⅛"x¼" soft balsa before removing from the plans.

Insert the aluminum tube as indicated on the plans, for the control wire to pass through. Add the top bulkheads, except where the wing fits and plank the rest of the fuselage. Sand the entire fuselage until it is smooth. Put the maple motor mounts in position. Drill holes for the motor and nail small plates with nuts attached to the bottom of the mounts.

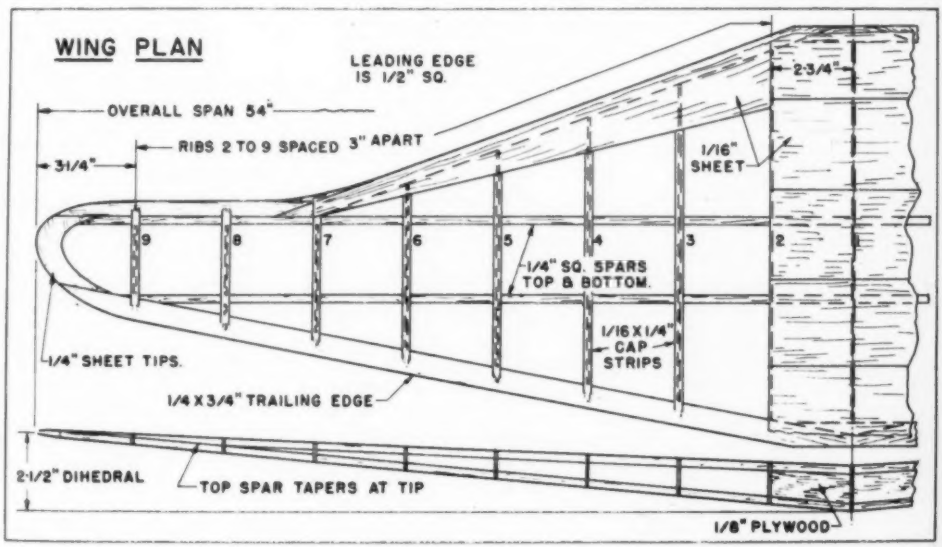




Make sure the top of the landing gear rests on top of the motor mounts. Solder small tin flaps on the landing gear, and make a streamlined fairing from hard balsa. After sanding this fairing to shape, cut with a razor blade down the dotted line. Now cut a ⅛" groove, lengthwise, on the fairing and press two pieces to the gear using plenty of cement. Flaps prevent the fairing from twisting.

Make the nose block (B) from a block of balsa 3½"x4¼". Carve to shape; hollow out to ½" thickness and cement to motor mounts and bulkhead No. 2. Plywood nose piece (No. 1) is now cemented on as indicated on plans.

Make the top removable nose block (A) from two pieces of balsa, 1¾"x4½", hollowed out to fit the motor. [*Continued on page* 151]



Left: A few old felt hats and some frames from the five-and-ten serve to create interesting and colorful pictures. Designs can be original or copied from a magazine. *Above:* Felt bicycle built for two.

Framing the Felt

FELT pictures are unusual and very colorful and can be made an interesting hobby. Subjects may be taken from newspapers, magazines or even from the family album. If your own attic doesn't have enough colorful old hats, search your friends' attics or attend rummage sales.

The background for the picture should be an even, flat piece of felt and can be purchased for a small sum at your local store. Pick out a piece the size of the frame you are going to use, and the color should be neutral, light fawn or blue gray.

Select the picture you wish to make, and with a soft pencil transfer it to strong tracing paper. Then cut the pattern in sections according to the colors you desire. Take the sections, one at a time, and place on the color of felt needed and pin securely. Cut with sharp scissors. When you have all the sections cut out, arrange them in the form of the picture on the felt background. Then sew the sections into place with a needle and thread—do not use glue. After you have the picture completed, trim background to fit the frame and complete the framing, and you will have another personal art treasure for your favorite nook.

Subjects especially good to work up are pictures of the gay nineties. If you are partial to Mexican art, you might try burros, serape draped figures, etc.

The laziness of the above scene is accented by the soft felt. Select surface and shadow colors that harmonize

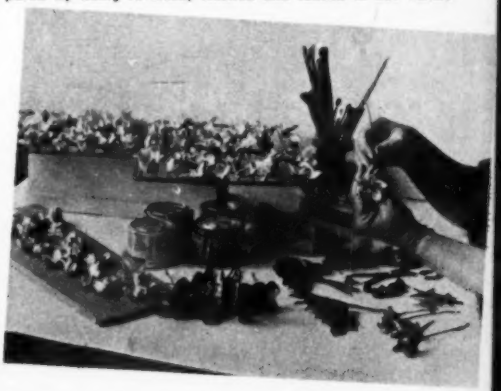
Roses from Rinds

ONE of the most artistic and fascinating handicrafts is the creation of realistic artificial flowers. A vase of flowers, even artificial flowers, if well done, gives one's room a radiant and friendly touch and often will turn an otherwise sombre room into one of colorful charm. A bright flower corsage will liven up that listless dark coat and change the whole appearance of last winter's dark dress.

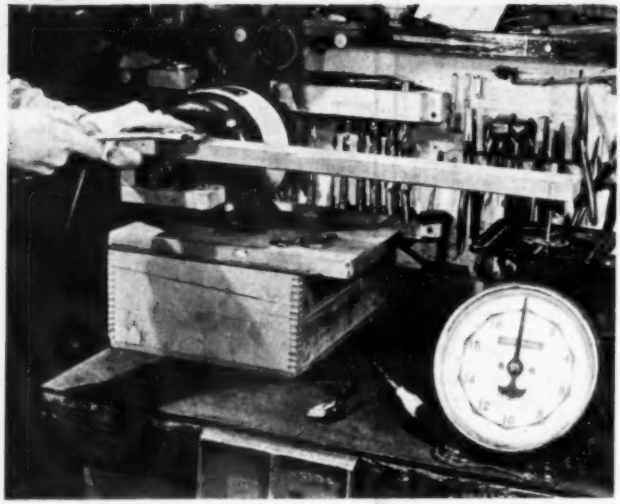
Can you imagine the creation of beautiful flowers out of the lowly lemon rind? Beauty out of waste. Lemons, whose juice is sour but still good for what ails us, can be glorified by making beautiful flowers out of the rinds. The lemon rind has natural veins and when allowed to dry over molds, the petals you make will curl into natural shapes by themselves.

The process is a very simple one. When extracting the juice, cut the lemon in half and squeeze the juice out by hand, being careful not to injure or break the rind. Then turn the rind wrong side out, being careful not to break it, and with a sharp knife scrape off the fleshy part. Then place the rinds in a pan of real hot water and allow to stand about an hour, thus removing the oil. When you take the rinds out of the water wipe them carefully with a dry cloth and then lay them away until you have accumulated twenty or thirty of them. As long as they are kept dry and clean they can be [*Continued on page* 174]

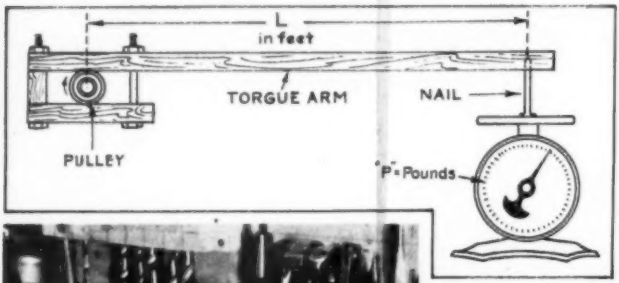
Top: Desert primroses and Mariposa lillies grace the large vase. All are made from lemon rinds. *Above:* Rinds are prepared by being reversed, cleaned and soaked in hot water.



Left: Cutting rind and tacking over paper moulds. Buds and half-open flowers are tied over paper rolls. *Above:* Painting and finishing with centers and stems. They'll last indefinitely.



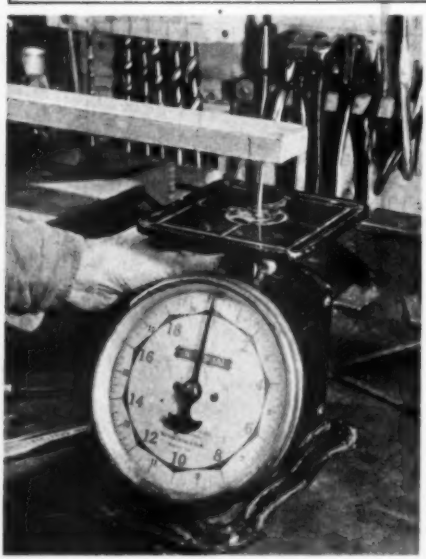
Prony-brake setup for checking small motors. Nut on the free bolt is being tightened.

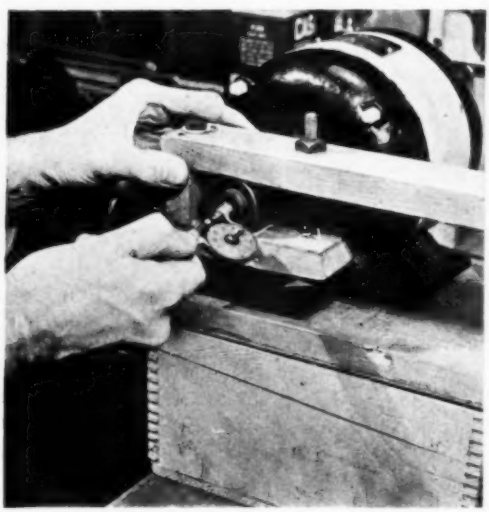


WHAT'S THE HORSEPOWER?

THE brake horsepower of small motors may be measured with reasonable accuracy in the shop, with the simple prony-brake arrangement illustrated. The equipment includes a speed indicator, a scale to measure weight in pounds, a flat pulley 2" wide and 1½" or more in diameter to fit the motor shaft, and a wooden torque arm.

This arm is a bar of wood measuring about ⅞"x2", and may be any length from about 16" up, with 22" or 28" about right for most conditions. Cut a strip of wood of the same thickness as the diameter of the bar and about 4" longer than the pulley diameter. Also make a block ⅞" thick, 2" long, and as wide as the pulley diameter less about ¼". With nails, tack the strip, block, and bar together as shown; then bore a hole through them to receive a ¼" or ⅜" bolt. Bore holes for [*Continued on page* 176]

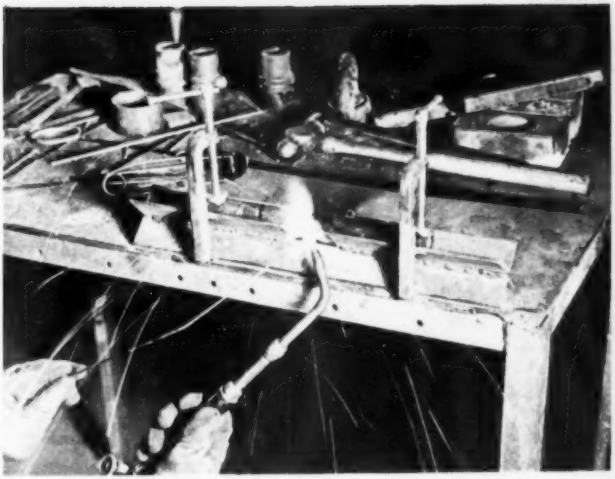




Above: Setting the scale at zero when the arm rests freely on it compensates for the weight of the arm. *Right:* Revolutions per minute of the motor shaft are determined with a standard revolution counter.

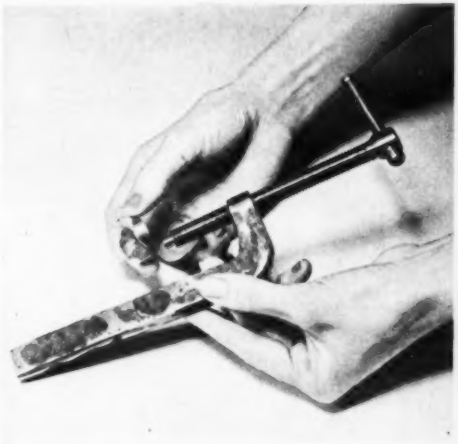
Welder's Clamp

CHANGING or turning the pipe is not necessary when this handy clamp is used on a welding job. It consists of two pieces of angle iron welded together. Note that a portion in the center is not welded and is later cut out. The two clamping parts are then prepared and welded to the angle iron assembly. This outfit will take pipe up to 3" outside diameter. Here are the specifications: Length, 18"; gap, 2½"; clamp, steel bar stock, ½"x¾"; screw, $\frac{7}{16}$"x5½"; handle, $\frac{5}{16}$"x3¼".



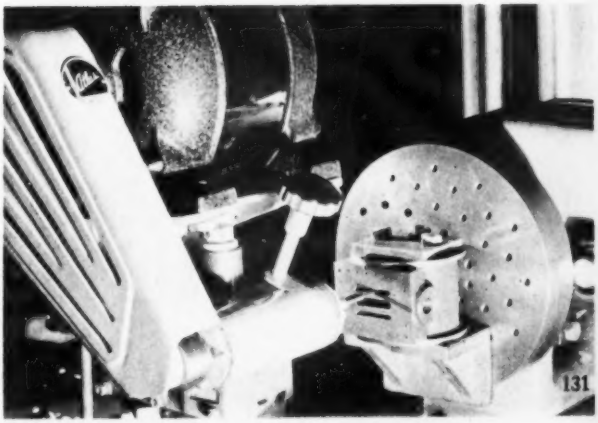
The completed clamp is seen above, while below the sawed-out section is being removed.

Above: The welder's pipe clamp in use. *Below:* Washer on clamp, made from ⅜"x1⅛" steel, has double V-shaped face.



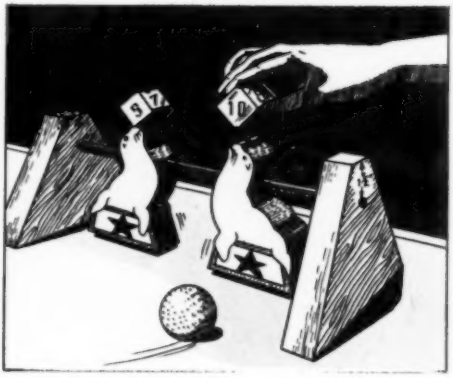
Milling With Tool Post Grinder

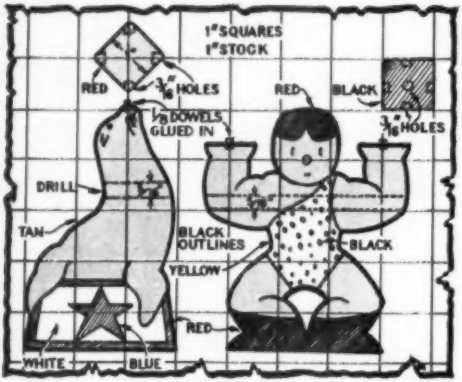
THE versatile tool post grinder can be used to advantage for very fine milling operations where it is necessary to run small cutters at extremely high speeds. By fastening the work on the faceplate of the lathe, as in the photo, the carriage and cross slide feeds can be used to accurately guide the milling cutter. The vertical position of the cutter can be adjusted to suit the work by raising or lowering the grinder on its tool post support. In using fine milling cutters high speeds are necessary.—*C. W. W.*



NINETEENTH HOLE
Indoor Golf Game

Here's a combination golf and numbers game to provide winter evening fun for the family.

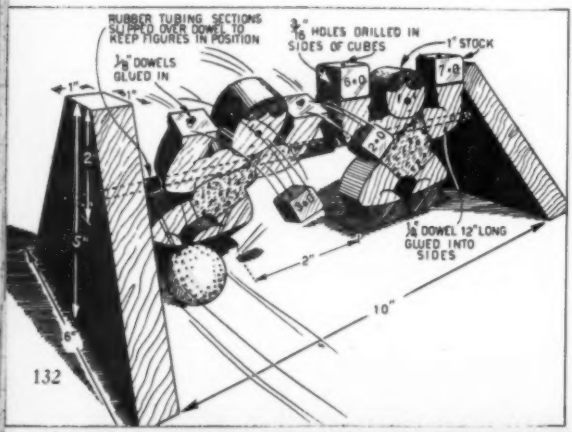




THIS game provides golf practice in putting and plenty of fun. The golf ball hits one of the figures and off fly the numbered cubes to the floor showing the score made.

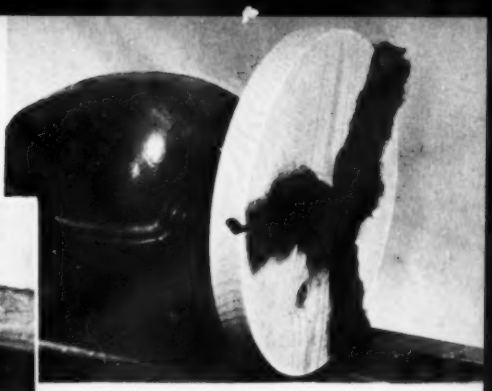
The entire toy is made from 1" stock, ¼" and ⅛" dowels and painted in bright colors. The figures are drawn on paper, traced to 1" stock, and jigsawed out; a $\frac{3}{16}$" hole drilled through each, so they may slip over the ¼" dowel axle they swing on, and ⅛" dowels glued into the noses of the seals and the hands of the strong men.

These dowels protrude ⅛" to hold the cubes in place. The sides are triangular 6" at the bottom 1" at the top with a ¼" hole drilled in the middle. These holes are drilled 1½" from the top of the hole on the seal design and 1¾" on the other. The cubes are cut 1" square and $\frac{3}{16}$" holes drilled in them as indicated in the squared drawing. The figures are slipped over the dowel axle—they must swing freely—sections of tubing being used to keep them in their proper position. The figures are 2" apart at the bottom. The ends of the dowel are then glued into the holes in the side sections, and the cubes set on. The figures swing ¼" from the floor, and the cubes must be loose enough so they fly off easily when the figures are hit.



Mechanix Illustrated

HOME AIDS



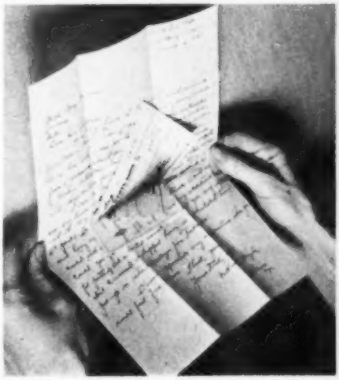
Pan Bottom Polisher

HERE is an efficient polisher for the blackened bottoms of cooking utensils. A disc is turned from 1" soft wood. Three holes are drilled from outside to center and slots are sawed into the holes. Wads of fine steel wool are pressed into the slots.

Clothes Box

A LARGE family cannot buy a laundry box big enough for its needs, but one can be easily made.

The pictures show one that is 22" deep, 31¾" high and 33½" long. Top is 22¼", leaving overlap for raising lid. Door panel (upper) is 33½" by 13¾". Bottom and back were drilled in ½" diameter holes on 3" centers, for ventilation. Plywood sides were drilled in initials.

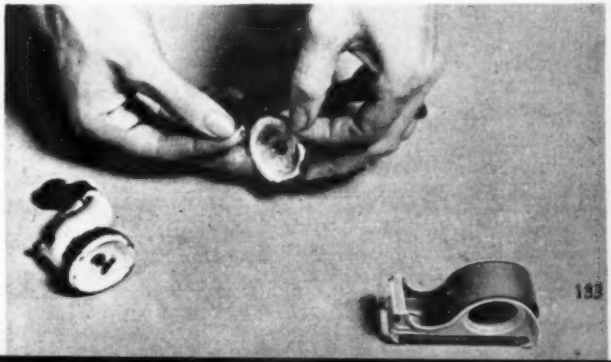


Mailing Checks

TO PREVENT any possibility of a check or bill slipping out or being shaken out of a letter lay it cat-a-corner on the sheet of paper, as shown, before folding. It is then folded in every fold of the letter with no possibility of its being lost.

Transparent Shaker "Stoppers"

WHEN filling your fancy salt and pepper shakers, use cellulose tape instead of corks to close the openings. You will never be annoyed with corks being accidentally pushed into the shakers.



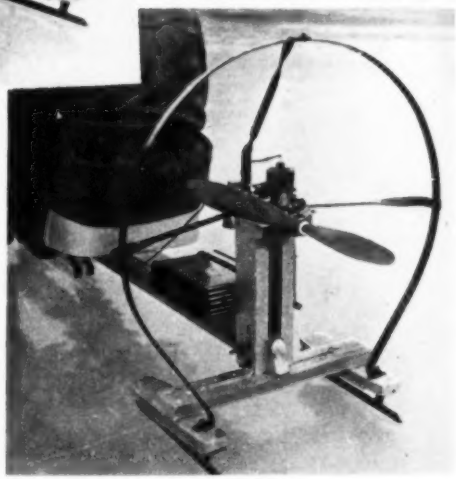
Baby Ice Scooter

Powered with a model plane engine, this little speedster carries a man-sized load across the ice at a surprising pace.

by

Howard G. McEntee

Left: Ready to go! Front runner acts as steerer, with foot-controlled cross bar. *Below:* Some kind of propeller guard is advisable to prevent injury in case of a spill. Prop has flat pitch, is hand-carved.



SEVERAL years ago the writer had occasion to run tests on model airplane motors, among them one of the largest stock types, a Forster Super B. These tests showed a surprising thrust, and immediately the inborn American urge to make something that would propel the builder by mechanical power asserted itself. After considerable reflection, it was decided that smooth ice offered about the most frictionless surface available, so a "pocket size" motor iceboat was settled upon.

The simplest means of drive and by far the most practical for such use appeared to be an air propeller. The first job used a model airplane propeller, the largest that could be obtained commercially. This was not a great success as the contraption would not propel itself with any sort of load. Thereupon a low pitched prop was carved and the first trial with this proved a huge success.

No attempt has been made so far to measure the speed attained. However, a very rough estimate of 20 m.p.h. seems reasonable, this with a 160-pound pilot as the load. Such a rate seems mighty high, however, when viewed from only a few inches above the surface! Naturally the speed increases as the load diminishes, and very good results are had with a rider weighing about 125 pounds. A really surprising pace was achieved on one occasion when the scooter, with engine wide open, got away riderless from the operator. Fortunately damage was negligible in the inevitable crack-up that followed.

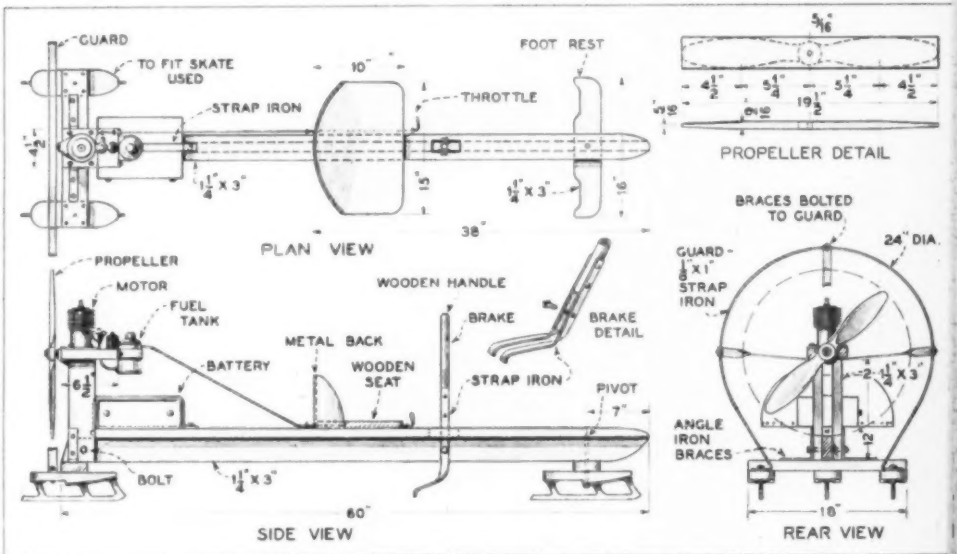
It seems unbelievable that the scooter, which weighs about 35 pounds, together with a 160-pound, heavily clothed rider, a total of well over 200 pounds, can be propelled so well by a tiny motor weighing a pound or less. It certainly speaks volumes for the efficiency achieved by present-day miniature motor builders.

Construction is simple, but so rugged that a 200-pound rider is carried without trouble. The backbone of the machine is a T-beam made by fastening two $2\frac{3}{4}$"x$1\frac{1}{8}$" pieces firmly together with screws. At the rear an elevated platform for the motor is built as shown in the drawings. The two uprights for

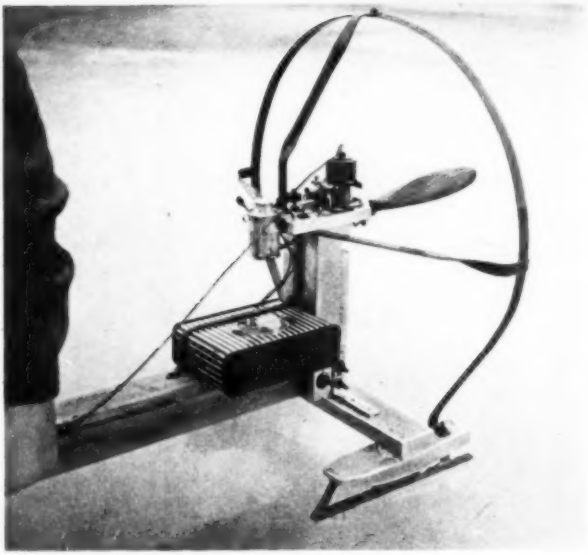
Off she goes for a 20 m.p.h. or better spin across the ice! Lever resembling plane joy stick is dependable brake.

this, together with the main beam and the cross piece at the rear, are all of the same size wood.

The platform atop the upright may be fastened in place with long wood screws. The lower ends of the uprights butt down against the rear cross member which holds the skates. It is held there by several long wood screws plus a 1" wide angle brace on each side. The brace is screwed to the cross member, but is held against the uprights by stove bolts which pass through the angle irons on each side, the two uprights, and the center piece of the T-beam. Into the latter three 2¼" wood screws are driven up from the bottom of the cross piece. The construction makes it possible to



Details of scooter's construction and engine mount are shown above.



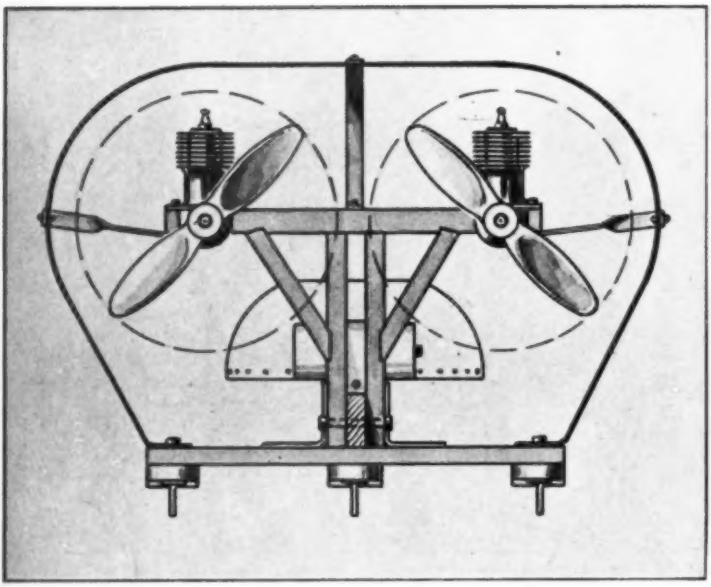
Right: Larger gas tank is substituted for the small one which comes with the motor. Hot-shot 6-volt battery provides plenty of juice.

remove the entire "power unit," which consists of motor, upright structure, cross member with the two rear skates, and propeller guard, in one unit, a great convenience when carrying the scooter in a car. To reassemble it is only necessary to drive in the three wood screws, and insert the three bolts, to form a rigid and dependable junction.

The cross-member has a skate block at each extremity, to which are fastened the two rear skates. The front skate must turn to allow steering, and has a cross bar for the feet. The pivot is simply a long bolt firmly fastened to the skate block and inserted in a hole in the front end of the T-beam. This method is crude, but effective, and permits the front skate to drop off for ease of transportation.

After all three skates have been fastened in place, the scooter should be set on a smooth surface and the skates checked to make sure they are at the proper angle as viewed both from the side and from above. This is important, and any improper angles must be corrected by altering the fastenings until the desired result is achieved. The rear skates must be parallel with each other as viewed from the top, and square with the surface. when seen from the side. The latter condition must also be assured for the front skate.

A few words might be helpful on the kind of skates to use. [*Continued on page* 178]



Two smaller motors may be used instead of the one specified in the text, if desired. A twin, side-by-side mounting, such as that suggested in drawing at *left* should give efficient results.

PORTABLE OIL STOVE
Doubles as Heater

by J. Modroch

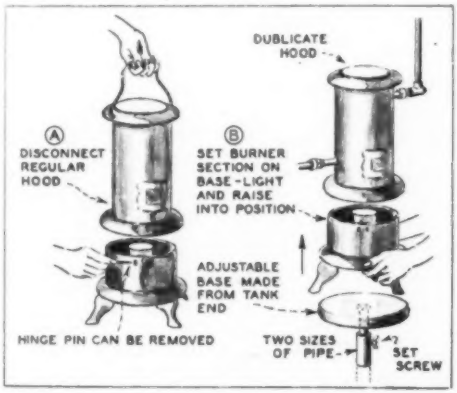
A PORTABLE oil stove doubles as the heat source in this inexpensive auxiliary water heater which is connected permanently to the household plumbing system for the purpose of supplanting the regular electric heater in the event of a power shut-off or other emergency.

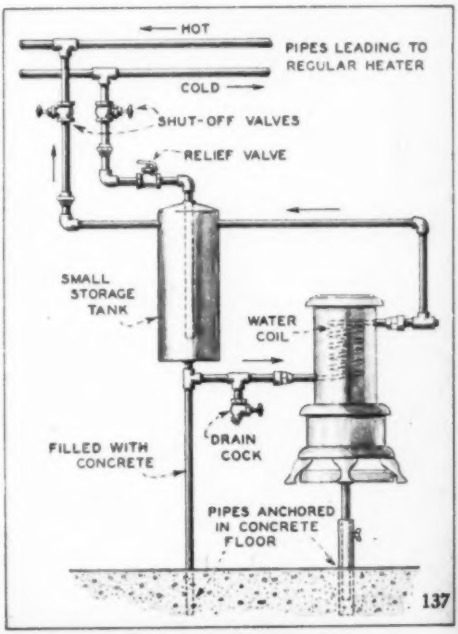
To simplify both the installation and operation of the unit a duplicate hood for the stove was bought at a used stove dealer's and installed as a permanent part. (You will have no trouble picking up an extra hood since it is the burner section of a portable that usually wears out first.) A water coil, made from a waste length (about 9') of copper tubing, runs through the hood and is connected with a small storage tank by a system of piping like that used for regular full size installations. See drawing.

The unit is put into operation by simply opening the two shut-off valves, placing the burner section of the portable on the adjustable base, lighting the burner and raising it into position. After the emergency is over, the few gallons of water that the unit holds can be conveniently drained into a couple of pails and the stove base returned to its regular use as a portable.

Used parts and materials may be employed in assembling a unit of this kind since only intermittent service is required of it.

Above: Heating unit can be put into operation in a jiffy, and as quickly removed. *Below:* Hookup and method of switching.



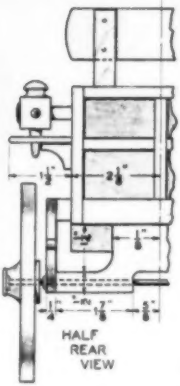


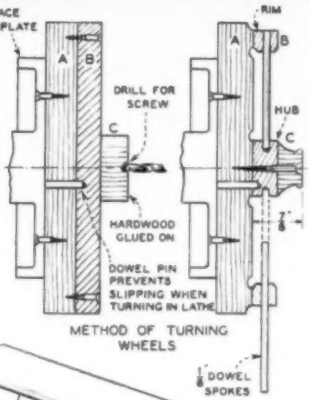
Bill Bildit gets in a jam

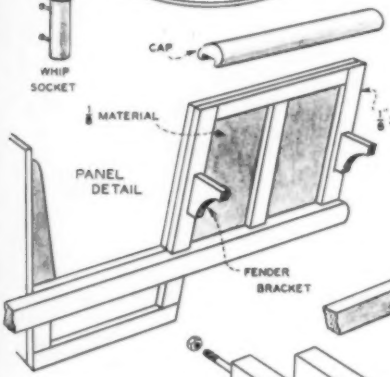
with Junior—and out again!

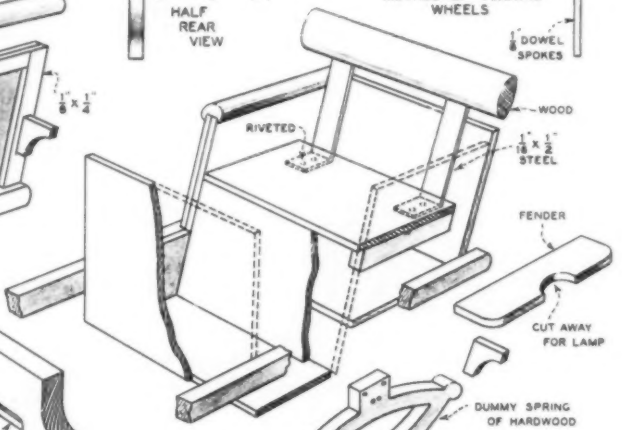
NOW TO ASSEMBLE THE SEAT AND RUNNERS... CASCAMITE GLUE AND SCREWS WILL MAKE A SOLID AND PERMANENT JOB OF IT
GLUE
5
JUNIOR WILL BE TICKLED WHEN HE GETS A LOAD OF THIS SNAPPY RED PAINT JOB. I'LL GIVE THE RUNNERS A NATURAL FINISH.
6
LOTS OF SKI WAX ON THE RUNNERS AND WE'RE ABOUT READY FOR A REAL RIDE. HEY JUNIOR!
GET IN THE SCRAP!
SKI WAX
7
WHEE!! GEE DADDY I'M GLAD YOU GAVE MY OLD SLED TO HELP WIN THE WAR. THIS VICTORY SLED IS EVEN MORE FUN.
LUNDBERG
8

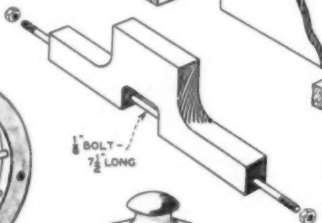
CAN YOU HITCH UP A HORSE?

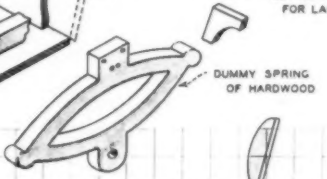


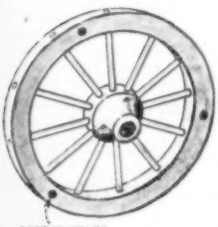


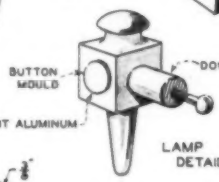


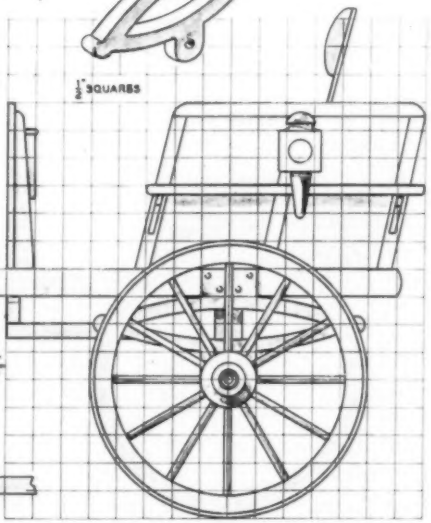


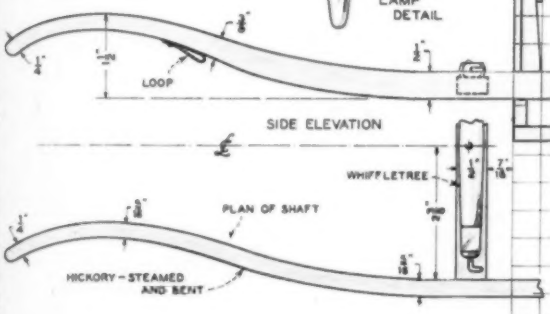


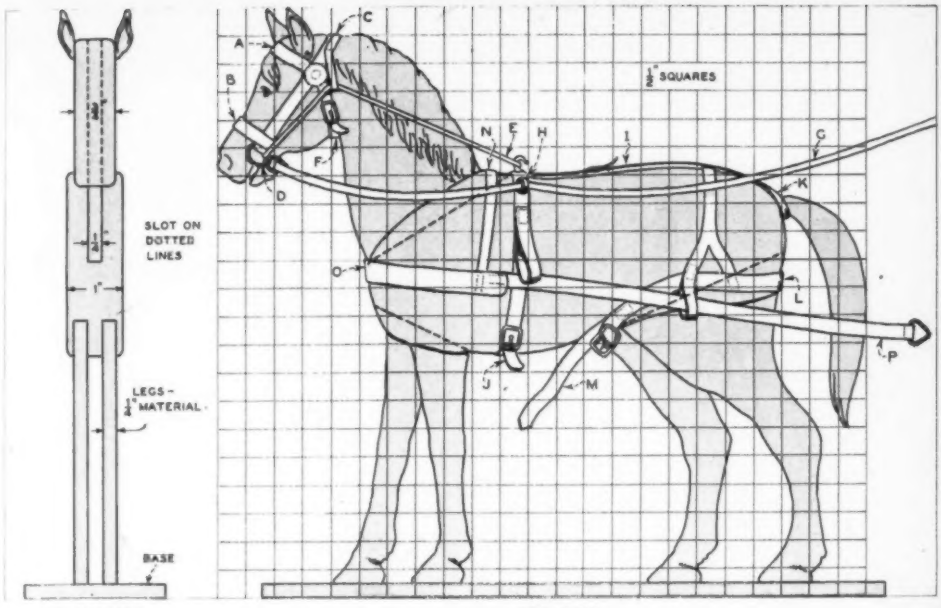


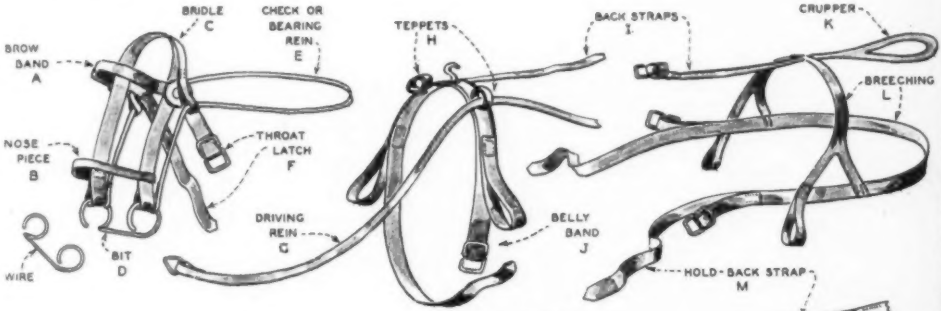


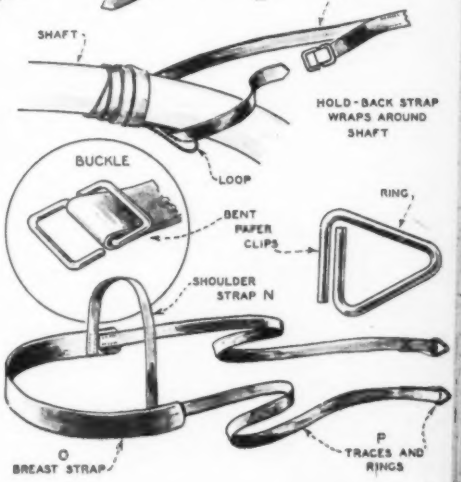












EVEN though you may not expect to be driving a horse instead of a car in the future, it's fun to learn how to hitch one up, and here is a model to practice on. It makes a good toy for Junior, too, and will show him that grandfather, who never heard of a carburetor or camshaft, had a pretty good time anyway.

The pony is a simple scroll saw job cut to the pattern given in the squared profile. Body is 1" white pine slotted for legs, neck and tail, and the head is built up with cheek pieces. Ears are of brown leatherette and the body should be painted to suit your individual choice—sorrel, bay, dappled gray or calico.

For harness use a soft thin leather or stout leatherette, assembled with leather cement or stitching. Such items as check-rein and crupper may be of round rawhide; the buckles are bent from paper-clip wire, as are the bit, loops on reins and traces. Terrets are strips of brass or tin. Note that the horse's mouth is slotted to admit the bit, which is first slipped in place, then the bridle put over ears and throat latch buckled. Traces, bellyband and breeching—more familiarly known as the "britchen" in the gay nineties—put on [*Continued on page 182*]

Wood Carver of Simple Construction

Plaster or metal figures can be duplicated in wood with the aid of this handy carver.

Above: The wood block after roughing out on the bandsaw, and the original plaster bust of MacArthur from which the copy was made. Hand coping saw may be used for the preliminary work if craftsman does not possess a bandsaw.

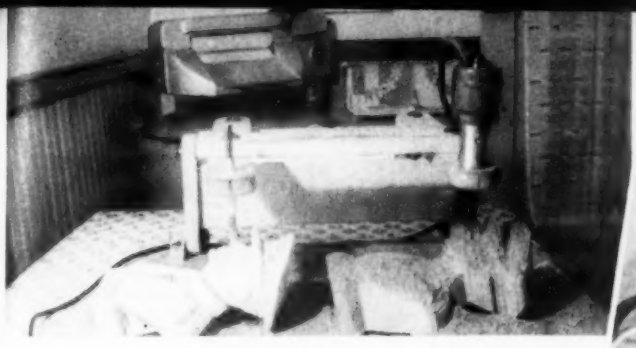
by Alfred Brosseau

WOOD carving machines are generally pretty expensive and complicated gadgets when purchased, and it is somewhat doubtful if one *could* be purchased today, except possibly second-hand. However, the craftsman having need of such a machine, and unable to locate one to fit his pocketbook, can build a very satisfactory carver, as described in this article, at practically no expense.

The carver will do surprisingly accurate work, making faithful copies in wood from plaster busts, etc. As a profit project the carver has good possibilities, because any number of duplicates may be easily turned out for sale.

A plaster bust of General Douglas MacArthur is used here to demonstrate what the machine can do, and the drawings show its construction and dimensions. Here's how it works:

Place a piece of paper and the bust on the floor directly under the ceiling light, then trace the outline by the shadow. A perfect profile and full face can be obtained. The paper is then glued to the block in correct position; profile on the side and

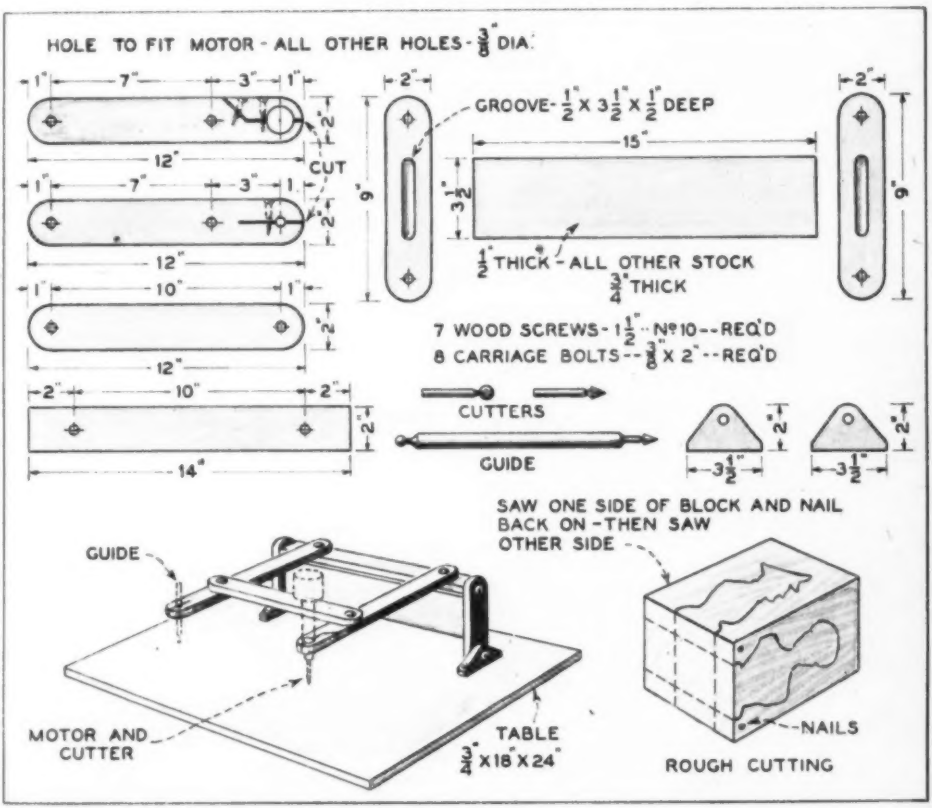


Above: The carver at work holding a "handy" power tool. *Right:* This picture gives an idea of the size of work the machine will handle. Smaller objects can also be copied.

face on the front. Bandsaw to the line.

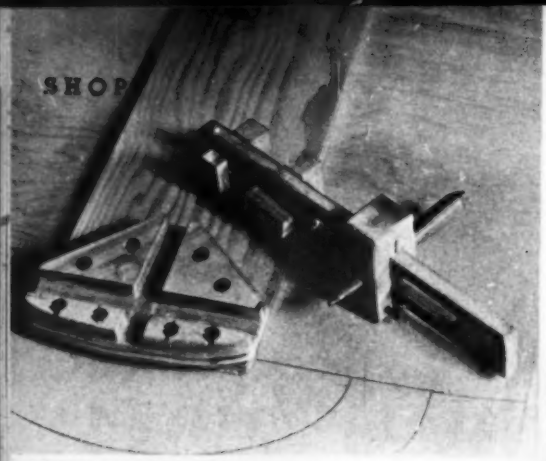
The plaster bust and the block to be carved are then placed on the machine in such a manner that the rotary tool can reach every part of the block. After screwing it in place with small angles, place the plaster model just in line and exactly ten inches (center to center) from the block, a wire with screws through each end, holds it in place. A few guides conforming with the cutters to be used are then turned out on the ends of a ⅜-inch diameter rod.

Actual carving is begun with a large ball shaped tool, roughing the whole area before changing tools. Then a smaller ball tool is used the same way. [*Continued on page* 174]

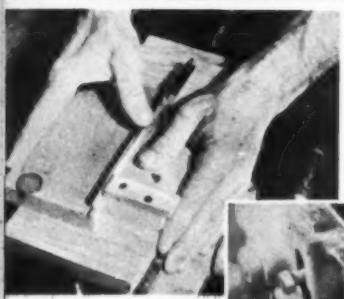


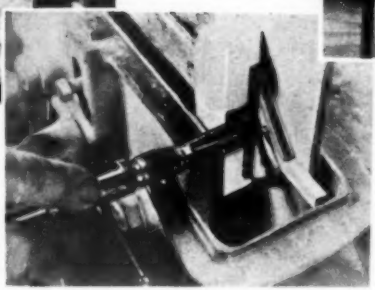
PRECISION POCKET TRAMMEL

by Edwin M. Love

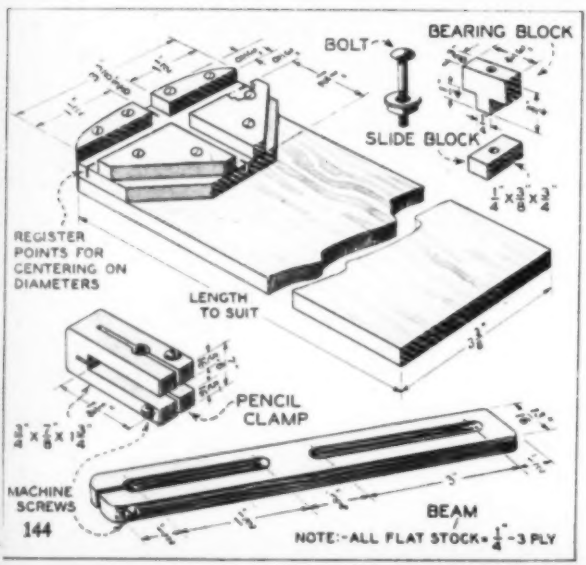


Right: Using the trammel to draw an accurate ellipse. *Above:* Assembled trammel.





Above: A file shooting board trues the guide blocks exactly. *Right:* Clamp the guide blocks so that screws will not draw them during insertion.



THIS handy little device draws a wide variety of ellipses, ranging from 1½"x3½" to 7½"x10¼". If accurately built, the beam can be lengthened for a 6" pencil slot, so that ellipses up to 13½"x16½" can be drawn. Built in a larger size, it would accurately scribe layouts for elliptical arches and window heads. Concentric ellipses are obtained by shifting the position of the pencil, and proportional ones by changing the adjustable sliding block, as well.

Since the guide blocks screwed to the base must be accurately square, it is worth while to make the shooting board illustrated in the photograph. Force the edge of a flat file into a saw kerf made ¼" from a straightened edge in one block, and slide this block along a second screwed to a base. A crosspiece fixed at right angles to the second block is a fence for the triangular pieces. A few strokes of the file polish the edges and make them square.

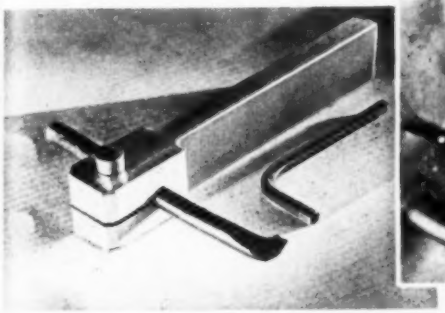
To assemble the guide section, screw [*Continued on page* 184]

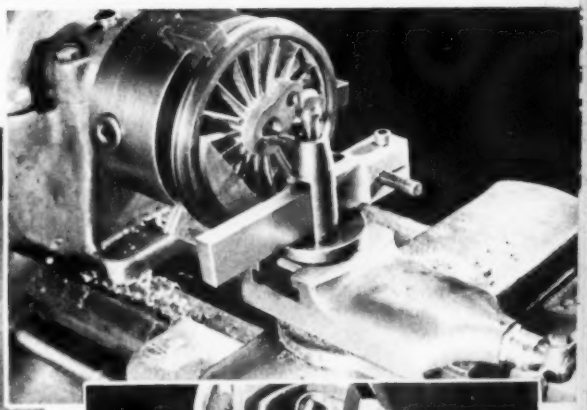
Boring Tool Holder

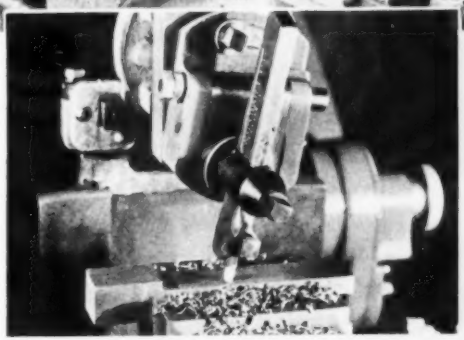
Simple accessory for metal-turning lathes.

by C. W. Woodson

Right: Boring tool in use on model locomotive wheel. *Below:* Allen set screw holds in place.



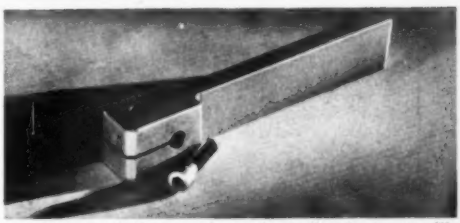




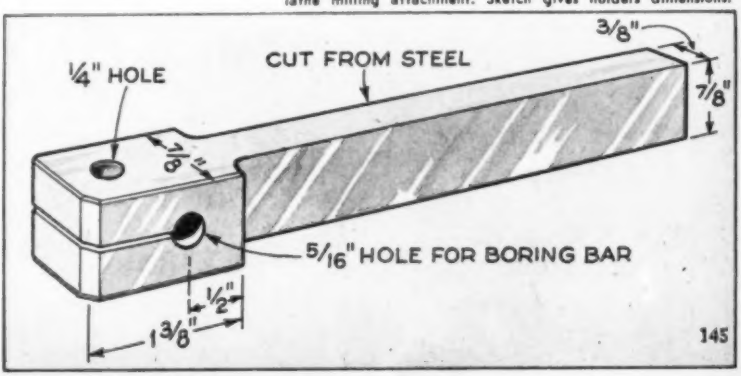
A SIMPLE but serviceable boring bar holder can be quickly made from a short piece of steel of most any kind that happens to be on hand. For the small lathe, stock about ⅞" square will work out well as this will give the tool head sufficient width to hold the boring bar rigidly. The shank will have to be cut down to fit the tool post slot and this can be accomplished in several ways. The milling attachment can be used, the work can be held on its side in the four jaw chuck, or as a photo shows it can be done in the shaper. Here ¼" of stock was cut away on each side leaving the shank ⅜" thick for a snug fit in the tool post slot. The sharp corners of the holder should be chamfered, the head end beveled, as indicated in the drawings, and the whole tool draw-filed bright.

A $\frac{5}{16}$" hole was drilled in the side of the tool head for the boring bar, the size of this hole, of course, should be made to fit the boring bar at hand. The hole in the top of the head was drilled, with a number 7 drill, for the clamping screw. The slot, which allows enough spring to firmly clamp the boring bar in place, was cut

[*Continued on page 176*]



Top: The tool holder may be made on the shaper, or with lathe milling attachment. Sketch gives holders dimensions.



WEE WAR WEAPONS

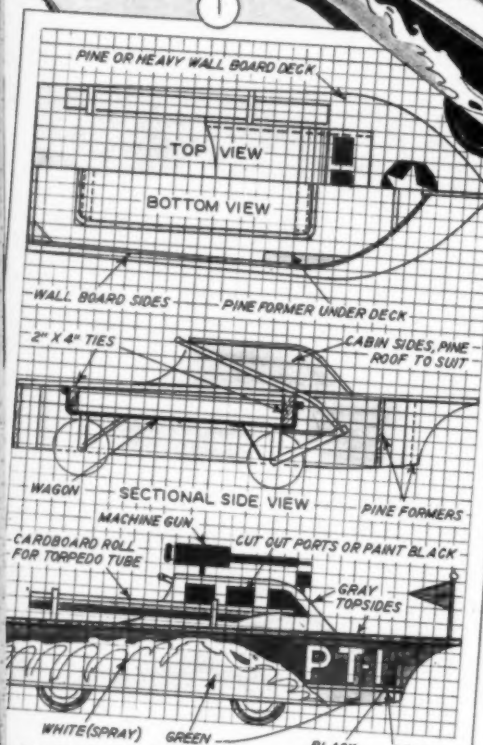
by Douglas Rolfe

WAR scooters which are sweeping the country this Christmas as the number one novelty in war toys afford endless joys to war-minded youngsters but are generally expensive to buy.

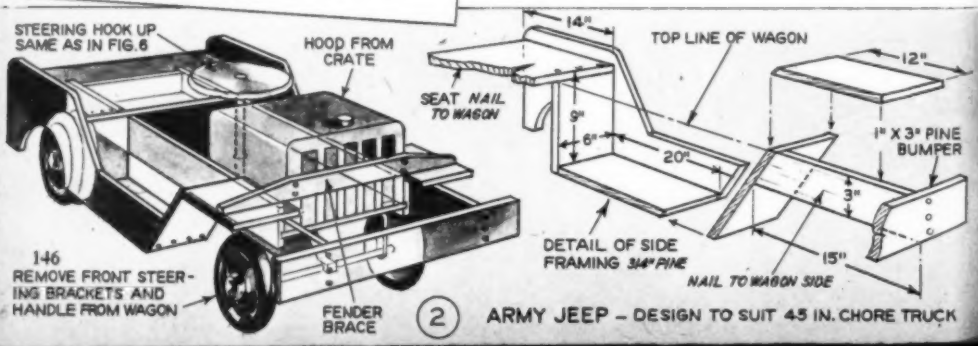
Fortunately these miniature tanks, mosquito boats, flak guns and jeeps are easily constructed in the home workshop from scrap material and, when mounted on Junior's old coaster wagon and given a few coats of suitable paint, perform and look just as well as the commercial jobs costing anywhere from $20 to $40 apiece.

Any old coaster wagon—metal or wood—will serve for the base or chassis. The superstructure can be made from scrap wood, wallboard, tin and (or), heavy cardboard.

Actual sizes should be determined by the size of the wagon to be converted. Draw-



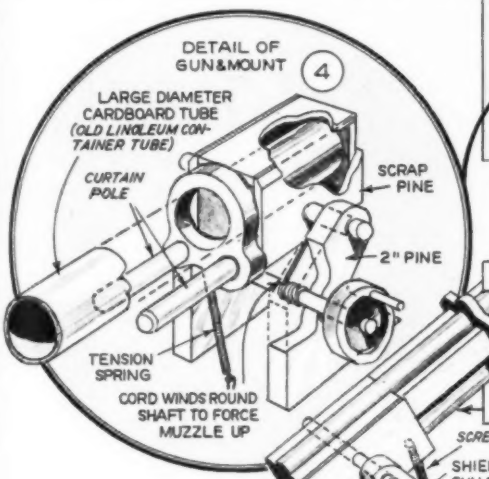
PT CONVERSION FOR 34-INCH METAL FLYER
2" SQUARES

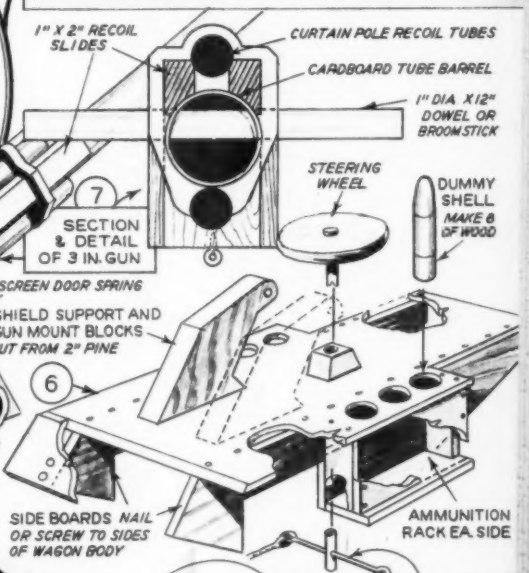


ARMY JEEP – DESIGN TO SUIT 45 IN. CHORE TRUCK

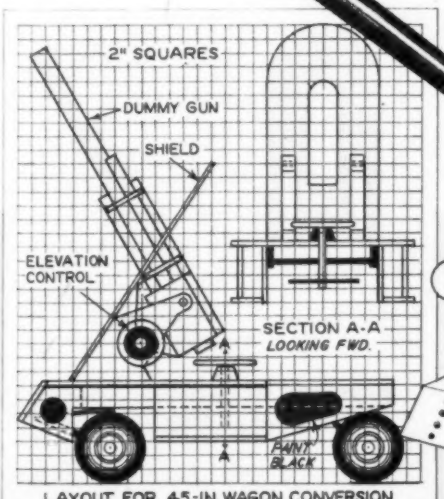
ings show two types and sizes of wagons in conversions.

Fig. 1 shows the most ambitious project—a *Mosquito* or PT torpedo class motor boat. The complete "boat" can be built as a unit and then mounted on the wagon available. Torpedo tubes are made from heavy cardboard rolls—the kind used generally for packaging congoleum rugs—and the machine gun can be either an out and out dummy with

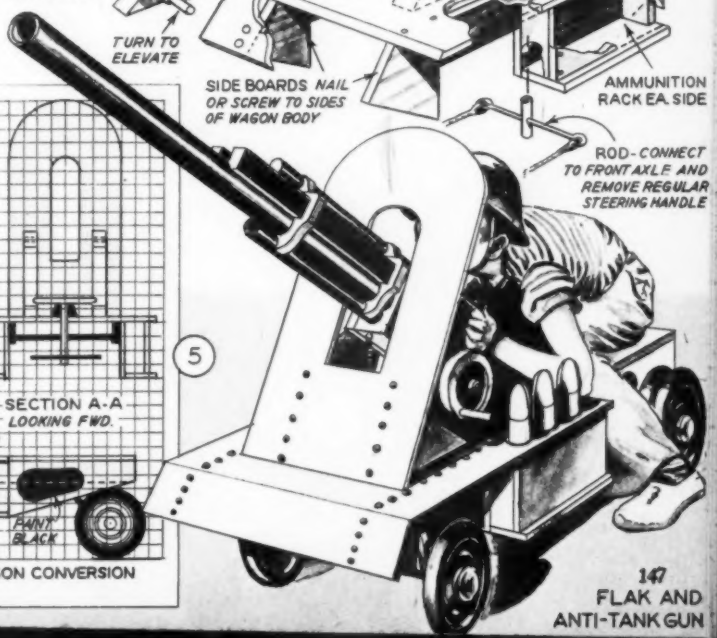


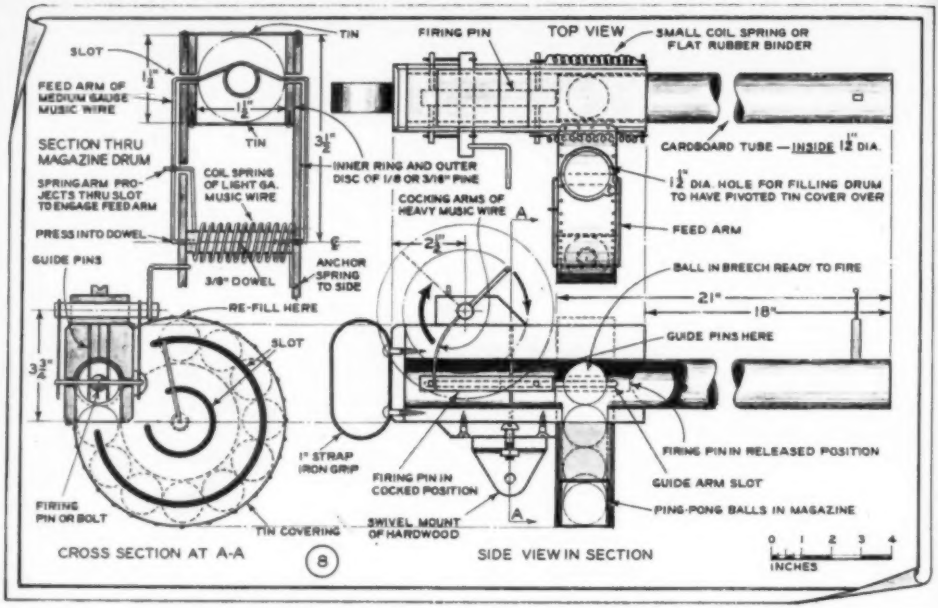

1" X 2" RECOIL SLIDES
CURTAIN POLE RECOIL TUBES
CARDBOARD TUBE BARREL
1" DIA. X 12" DOWEL OR BROOMSTICK
STEERING WHEEL
DUMMY SHELL MAKE 6 OF WOOD
7
SECTION & DETAIL OF 3 IN. GUN
SCREEN DOOR SPRING
SHIELD SUPPORT AND GUN MOUNT BLOCKS CUT FROM 2" PINE
6
CORD WINDS ROUND SHAFT
TURN TO ELEVATE
SIDE BOARDS NAIL OR SCREW TO SIDES OF WAGON BODY
AMMUNITION RACK EA. SIDE
ROD - CONNECT TO FRONT AXLE AND REMOVE REGULAR STEERING HANDLE

Any kid with a scooter or express wagon can make himself one of these realistic war toys.



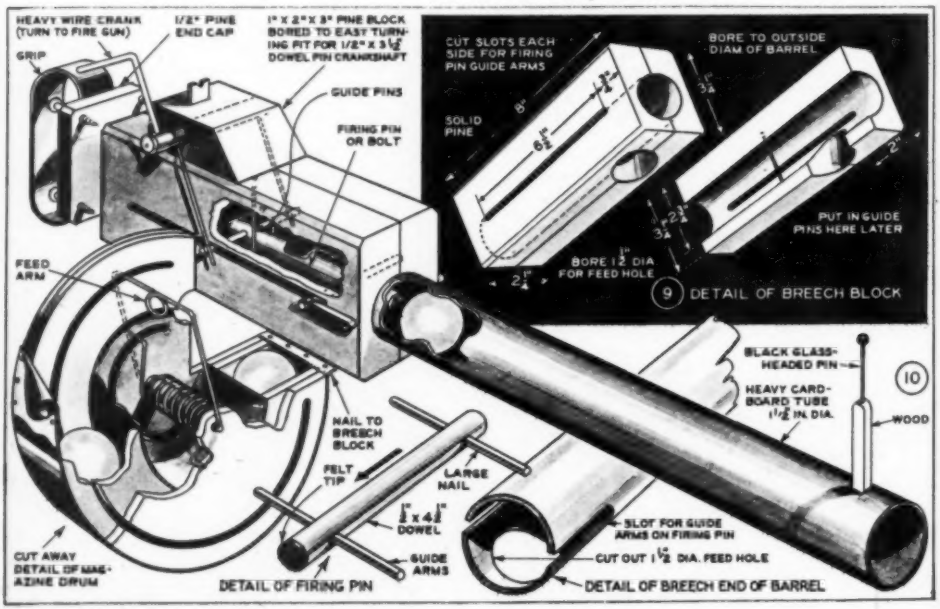
LAYOUT FOR 45-IN. WAGON CONVERSION



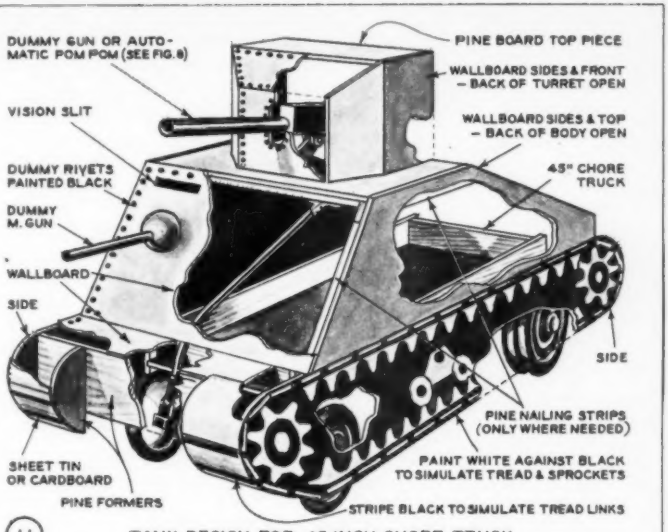


a piece of broomstick for the barrel or a real firing gun of the type shown in Figs. 8 to 10 may be installed. Painting the hull sides with a water and spray effect as indicated in the illustrations adds to the realism of this land-going ship.

The Jeep shown in Fig. 2 is very simple to build and can be modified still further to suit the builders' tastes and the material available. This conversion necessitates the removal of the ordinary wagon steering handle and front steering bracket. In place of these the car is steered by a wooden steering wheel connected to the front axle as shown in the details for

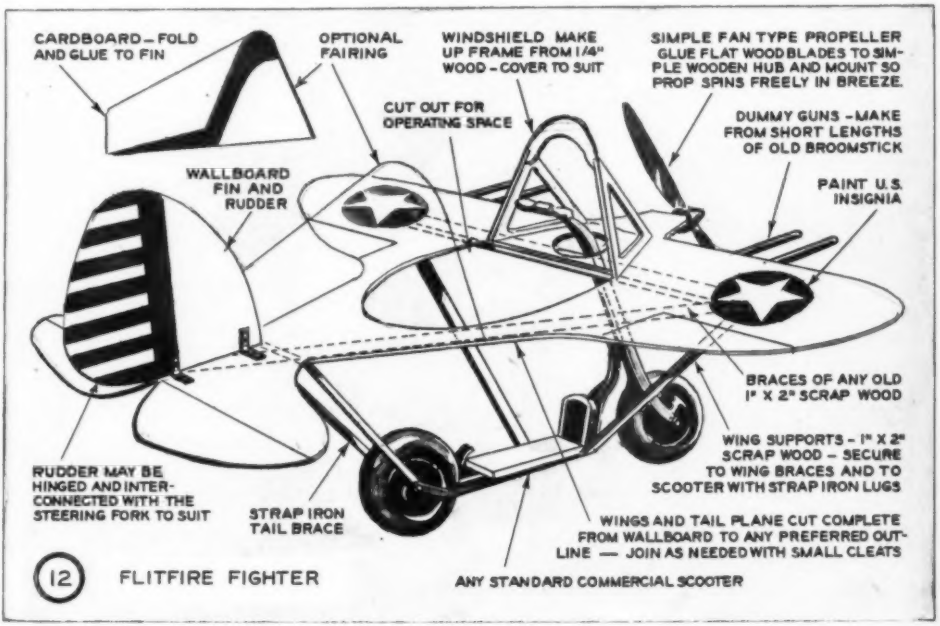

HEAVY WIRE CRANK (TURN TO FIRE GUN)
1/2" PINE END CAP
1" X 2" X 3" PINE BLOCK BORED TO EASY TURNING FIT FOR 1/2" X 3 1/2" DOWEL PIN CRANKSHAFT
GRIP
GUIDE PINS
FIRING PIN OR BOLT
FEED ARM
NAIL TO BREECH BLOCK
FELT TIP
LARGE NAIL
1/2" X 4 1/2" DOWEL
GUIDE ARMS
CUT AWAY DETAIL OF MAGAZINE DRUM
DETAIL OF FIRING PIN
CUT SLOTS EACH SIDE FOR FIRING PIN GUIDE ARMS
SOLID PINE
BORE TO OUTSIDE DIAM OF BARREL
PUT IN GUIDE PINS HERE LATER
BORE 1" DIA FOR FEED HOLE
9 DETAIL OF BREECH BLOCK
BLACK GLASS-HEADED PIN
HEAVY CARDBOARD TUBE 1 1/2" IN DIA.
WOOD
10
SLOT FOR GUIDE ARMS ON FIRING PIN
CUT OUT 1 1/2" DIA. FEED HOLE
DETAIL OF BREECH END OF BARREL

The tank body is very simply made of two side pieces cut to the general shape shown. Sides should be long enough to extend well in front of the wagon so that the steering bracket and handle are completely covered in when the front piece is assembled. Painting the lower part of the sides to simulate tracks adds to the realism of this miniature tank. Tank structure can be secured to wagon with cross boards nailed to sides.


DUMMY GUN OR AUTOMATIC POM POM (SEE FIG. 8)
PINE BOARD TOP PIECE
WALLBOARD SIDES & FRONT – BACK OF TURRET OPEN
VISION SLIT
WALLBOARD SIDES & TOP – BACK OF BODY OPEN
DUMMY RIVETS PAINTED BLACK
45" CHORE TRUCK
DUMMY M. GUN
WALLBOARD SIDE
SIDE
PINE NAILING STRIPS (ONLY WHERE NEEDED)
SHEET TIN OR CARDBOARD
PAINT WHITE AGAINST BLACK TO SIMULATE TREAD & SPROCKETS
PINE FORMERS
STRIPE BLACK TO SIMULATE TREAD LINKS
11 TANK DESIGN FOR 45-INCH CHORE TRUCK

another project using this form of steering (Fig. 6).

Fig. 3 shows a mean looking mobile assault gun. This and the combination flak and anti-tank gun shown in Figs. 5 to 7 utilize the same general form of construction and only differ in the gun details. If the guns used on these jobs seem too complicated for your purpose a simpler form of dummy gun can be made and mounted instead. Actually the guns shown are quite simple and their realism will more than repay the trouble of building. Elevation control of the guns is achieved by a length of sash cord secured to a rotable shaft. One end of the gun breech block is held to the platform with a piece of old screen door spring and the other end is anchored to the shaft with the sash cord. Thus, turning the [*Continued on page* 182]


CARDBOARD – FOLD AND GLUE TO FIN
OPTIONAL FAIRING
WINDSHIELD MAKE UP FRAME FROM 1/4" WOOD – COVER TO SUIT
SIMPLE FAN TYPE PROPELLER GLUE FLAT WOOD BLADES TO SIMPLE WOODEN HUB AND MOUNT SO PROP SPINS FREELY IN BREEZE.
CUT OUT FOR OPERATING SPACE
DUMMY GUNS – MAKE FROM SHORT LENGTHS OF OLD BROOMSTICK
WALLBOARD FIN AND RUDDER
PAINT U.S. INSIGNIA
BRACES OF ANY OLD 1" X 2" SCRAP WOOD
WING SUPPORTS – 1" X 2" SCRAP WOOD – SECURE TO WING BRACES AND TO SCOOTER WITH STRAP IRON LUGS
RUDDER MAY BE HINGED AND INTERCONNECTED WITH THE STEERING FORK TO SUIT
STRAP IRON TAIL BRACE
WINGS AND TAIL PLANE CUT COMPLETE FROM WALLBOARD TO ANY PREFERRED OUTLINE — JOIN AS NEEDED WITH SMALL CLEATS
ANY STANDARD COMMERCIAL SCOOTER
12 FLITFIRE FIGHTER

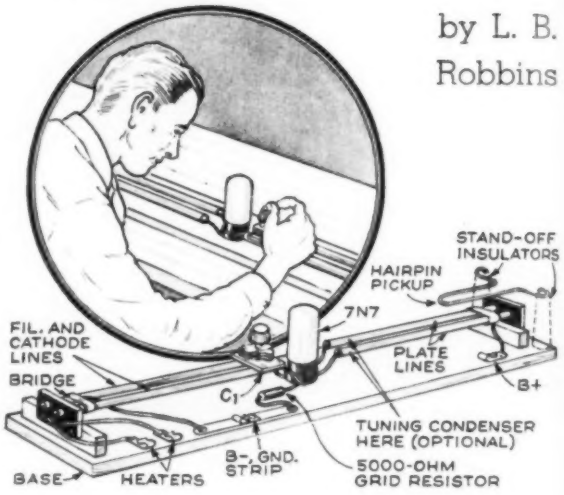
RESONANT LINE TRANSMITTER

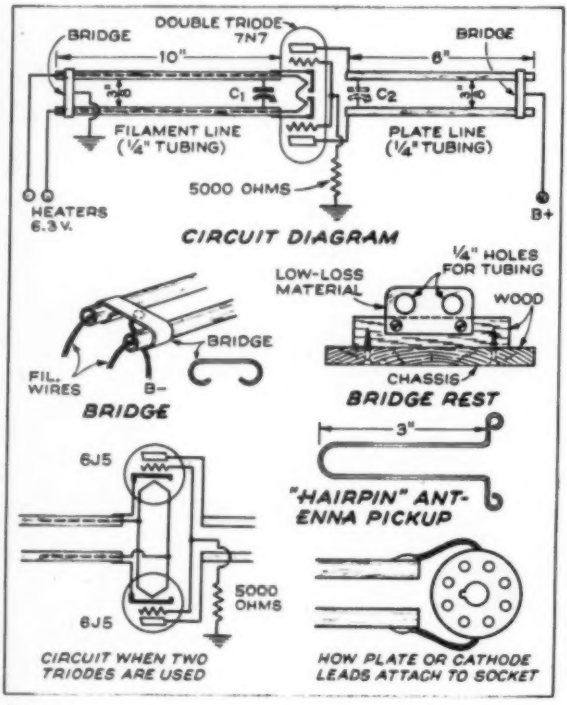
For 1¼ Meters

by L. B. Robbins

AT THE very ultra-high frequencies it is usually difficult to produce oscillation in many of the more ordinary types of tubes. But, by the use of *resonant lines* instead of the customary tank circuit, strong oscillations can often be produced at as low as one meter. This was attempted using a double triode—a 7N7 in a push-pull circuit—and proved highly successful. Two common 6J5 tubes in push-pull will also operate at those same frequencies in a resonant line circuit.

This type of transmitter is easily built and employs a minimum of parts and material. The perspective drawing shows an ideal assembly for such a circuit and is almost self-explanatory. Use ¼-inch copper tubing for both plate and cathode lines.





Cut two pieces 10 inches long for the cathode lines and two more pieces 6 inches long for the plate lines. Each pair of tubes should be arranged parallel and about ⅜-inch apart. You will note by the diagram and assembly sketch that the circuit diagram is followed closely even in the actual layout.

Mount the socket just off center of a 6-inch wide board for the base. Filament prongs face one end. Run an insulated wire through each filament line tube. Support the tubes as noted in holes in a piece of low-loss material like polystyrene mounted on a small wood block. Bridge each pair of tubes with a strip of spring metal that will make close contact. Also, by suitable metal straps or tabs, solder the tuning condenser, C1, to the two rods. Grid terminals connect to the B minus strip through a 5,000-ohm resistor.

Mount the plate lines to the base in a similar manner as used for the grid lines. Supports next to the tube can be dispensed with if stiff wires are soldered from tubes to socket terminals.

Under ordinary circumstances this [*Continued on page* 184]

"Manta" Fighter Model Plane

[*Continued from page* 127]

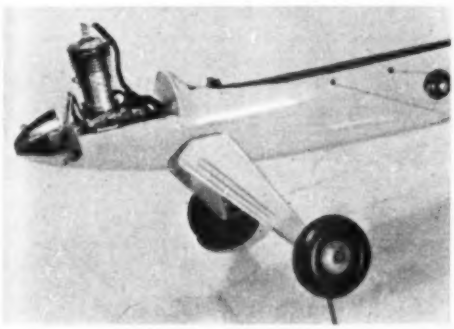
It is held in place by four 1/8" dowel sticks as shown on the plans, and a thin aluminum band 1/2" wide screwed to block (B).

Rudder, Stabilizer And Control Plate

The rudder and stabilizer are made alike except for elevators. The stabilizer is made and sanded to streamlined shape on top only, to give it a slight lift. Glue the stabilizer to the fuselage. Elevator (D) and block (C) are next carved and sanded to shape. Cut a 1/4" groove in block (C) and cement a 1/4" O. D. aluminum tube in place, as shown. Take a 3/16"x12" dowel and drill a 1/32" hole 1/2" long in each end. Insert the dowel through the tube and cement block (C) to elevator spar and fuselage. Take two pieces of 1/32"x1 1/4" wire and push through 1/4" ribs of stabilizer into holes in the dowel. Cement the other end of the wire firmly to the rib. Control horn is next cemented to the left elevator. Carve the tail blocks (E) and (F) and cement to top and bottom of elevator.

Cut a 3/16" groove in the elevators and cement to the dowel, making sure to keep them in alignment. Cement 1/8"x2"x3 5/8" plywood bearer in position as shown. Cut the aluminum control plate to shape. Center hole is 3/16", others 1/32". Bolt the control plate to the plywood bearer with a 3/16" bolt, using two washers as a bearing. Solder a nut on top to prevent it from working loose.

The rudder is self-explanatory. Be sure to sand to a streamline shape. Offset the rudder to the left 3/16". Streamlined fillets of soft balsa are next added to the rudder and the stabilizer.



This photo demonstrates the effectiveness of the fore-and-aft sprung landing gear used on the *Manta*. Designed by the author, the gear has never broken in more than 300 flights.

The Wing

First cement the two front spars to the plywood center section. While this is drying, cut out the ribs. Lay the front spars on the plan and rear lower spar. Cement all ribs in place and then add leading and trailing edges and rear top spar. Add 1/16" sheet balsa to top and bottom of the leading edge. The center section is planked with 1/16" sheet balsa. Sand the wing smooth. Build up the fuselage until the trailing edge of the wing is raised 1/4". Pin the wing to the fuselage and use the top of bulkheads 3, 5 and 6 to build up the top of the fuselage, which is removable with the wing. Plank this section the same as the fuselage. The wing is held on with rubber bands.

My original ship was covered with silk. The method I used was to thin dope with two parts thinner to one part dope for the first six coats, or until the pores in the silk are filled. After this, the dope may be applied more heavily. The ship had, altogether, twenty-two coats of clear dope and was striped in red and yellow. If you cannot procure any silk, a good grade of gas model paper may be used.

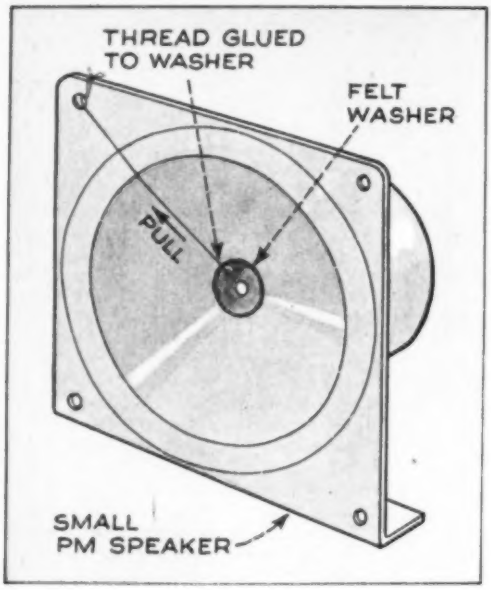
The propeller spinner is made from an old chrome plated automobile fender light, cut off to the required length in a lathe. Cut out slots to fit the propellor to be used. A special nut will have to be made 3/4" long, threaded on one end to fit the motor and threaded on the opposite side for a 6-32x1/2" machine screw. Refer to the plans for more details. When putting on the prop and spinner, slide on the 2" aluminum plate first, then the prop, then a special nut and then the spinner. Tighten machine screw until spinner is flush against aluminum plate.

Flying The *Manta*

Procure two lengths of 72 lb. test casting line. Each one must be seventy-five feet long for flying. Hook them up to the two wires on ship and to the top and bottom of the control handle. Test to be sure that when the hand is tilted back elevators are up. Have an assistant hold the ship while the motor is warming up. Always have him hold the ship until you signal to let go. For the first few flights keep at about three-quarters throttle until you are used to the ship. Don't attempt to loop the ship when it is wide open, as it goes too fast. Don't use less than seventy-two pound test casting line for safety's sake. Here's hoping you get as much enjoyment with this model as I have. If there are any things which are not clear, send a self-addressed envelope to me, and I shall be pleased to answer any questions.—*Artie Gray, Greenbrook Road, R. F. D. No. 1, Bound Brook, New Jersey.*

Build with blueprints. MECHANIX ILLUSTRATED conducts a blueprint service for the convenience of its readers. You will find a partial list of available plans on page 34.

Radio Sparks

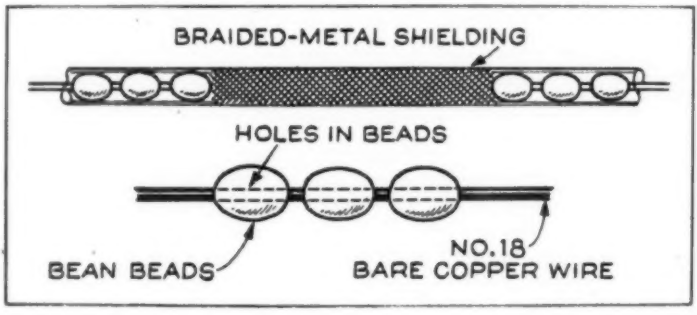


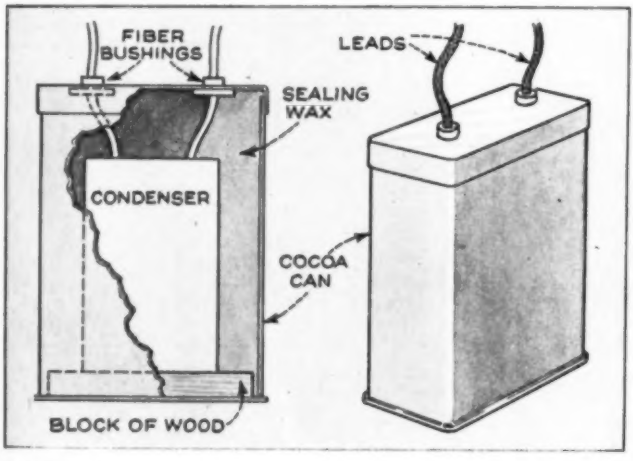
Curing Speaker Rattle

MANY of the midget receivers develop a rattling of the speaker after a period of use. By pressing the diaphram lightly, a point will usually be found where the rattle stops. Thread a needle and run the thread through that side of the little felt washer in the center of the cone. Reinforce it with a spot of strong glue. Then when dry, pull the thread gently. At the right tension the rattle will disappear; tie the thread to the speaker frame.

Home Made Co-Axial Cable

CO-AXIAL cable is the ultimate in feeding a high-frequency antenna, but it is expensive and today well-nigh unprocurable. For use indoors a good substitute cable can be made out of simple material. Buy an assortment of bean-beads and string on wire. (Right).



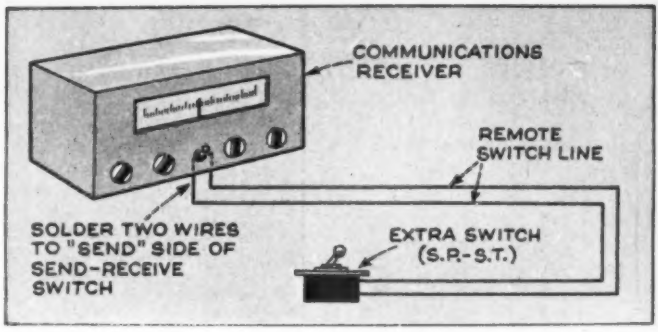


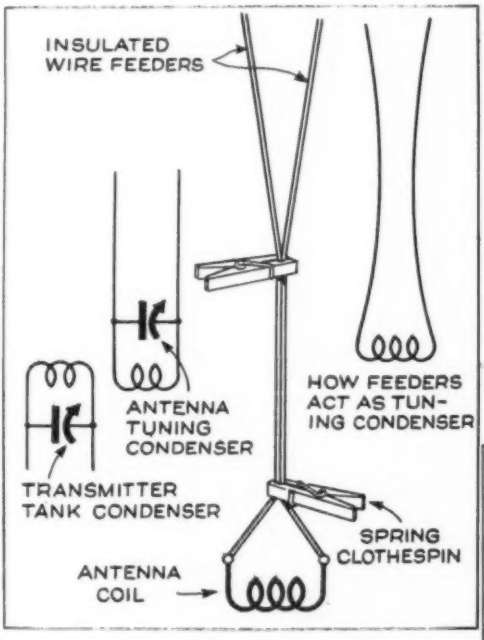
Mounting Unshielded Filter Condensers

UNMOUNTED filter condensers are difficult to arrange in a power-pack or otherwise but here is a simple method of enclosing and mounting them. Place a small block of wood in the bottom of a suitably sized cocoa can and set the bottom of the condenser on it. Bore two holes in the cover and insert fiber bushings or short pieces of large spaghetti in them for the two condenser leads. Pour hot paraffin or melted B battery wax in the can all around the condenser and fill to the top. Then jam on the cover and catch it around the edge with a few drops of solder. This gives you a fully shielded condenser. Pack together in a case for future use.

Receiver Remote Control

IF YOU wish to make or break the reception of a receiver from a distant point in the room or house it can be simply done as at right. Open the cabinet to locate the send-receiver switch. Solder two wires to the *send* side of the switch and lead them to desired part of building. Replace case and connect a second SPST switch to the end of the added wires.





Tuning The Antenna

SOME types of ultra-high frequency antennas have to be tuned across the antenna coil feeders to match the tank frequency. This is normally done by means of a small condenser across the antenna coil, as indicated. In case one is not available, a simple method of tuning is shown at left.

As it is known that parallel wires have capacity in themselves, this fact is made use of in this case. Bringing these feeder wires closer together increases their capacity proportional to the length of wires involved. Therefore, it is only necessary to closely parallel the feeders for sufficient distance to produce the required capacity.

Use two spring clothespins for this purpose. Pinch the feeders together close to the antenna coil. Then, loosely pinching the second clothespin about the feeders, draw it along their length until the right reading is produced in the plate tank milliammeter to indicate a loaded antenna. Fasten at that point.

Paper And Copper Shielding

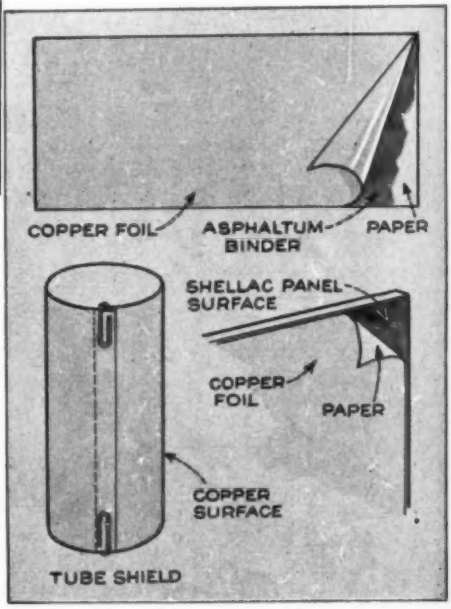
COPPER foil mounted on heavy paper, used in heat insulating, makes good shielding. It is inexpensive and even more so if you can buy short ends, waste pieces.

The foil is very thin but just as effective as shielding. It is firmly secured to a heavy craft paper with asphaltum, and the entire structure can be cut with shears and shaped as desired.

Tube shields are easily made by rolling up a cylinder of this material with the foil on the outside. Lap the joint and catch top and bottom with paper clips.

Wood or non-metallic panels can be thoroughly shielded by cutting a piece of this foil the size of the panel. Shellac the panel surface and when it is tacky, press the paper side of the foil against it, rubbing briskly to make a firmly adhering job. With the copper on the outside it makes a nice appearing panel.

Many other uses around radio can be found for this material.



Playroom Furniture

[*Continued from page* 120]

horizontal part of the sides and also to the back. Then press it down and nail it to the sloping part of the sides. Most ¼" plywood will take this gentle bend easily, but if very dry plywood is being used and there is danger of its cracking, score the underside before bending.

A "railing" of scrap wood and a strip of ¼"x¼" moulding are nailed to the top of the desk. This is to keep pencils, crayons, etc., from rolling off. One photograph also shows that the legs of the desk are provided with "cuffs" of scrap sheet metal. These serve a double purpose. They prevent splintering and they can be slid down and nailed in a new position in order to make the desk an inch or two higher as its little owner grows, thus prolonging its usefulness.

The nuts on the bolts that hold the front legs in place are countersunk in the leg. The depressions are filled with crack-filler before the painting is done. For dimensions of the desk see Fig. 3.

The Chair. The seat of the chair is square with rounded edges and with the corners also slightly rounded. The front legs are secured to the seat by means of dowel pegs glued in, and also by means of corner braces glued and screwed in place. The dowel peg has a saw-cut at each end, and a small wedge of hardwood is forced into the cut. Tapping causes the wedges to spread both ends of the peg slightly, one down in the leg and the other visible above the chair seat. In order to prevent possible splitting of the chair seat have the saw-cut in the peg at right angles to the grain of the seat. This method makes a very tight fit. Cut off surplus peg when the glue is dry and sand flush with the seat.

When cutting the back legs (the upper part of which also form part of the chair back) to the curve shown in Fig. 4, use a band saw, coping saw or jig saw. If several chairs are to be made, lay out and mark the wood so that the concave curve of one leg is the convex curve of the next. Eight curved legs, enough for four chairs, can be cut from a plank 11" wide, with due allowance for kerf.

Screwed into the inch-thick seat and curved braces of plywood secure the curved legs in position. A rung of dowel stick connects a back leg with a front leg.

The back of the chair is of ¼" plywood and is shaped as shown on the graph-squares in Fig. 4. Tenons on this back piece are glued into mortises cut into the upper part of the curved legs.

Painting and Decorating. All nails and screws that are prominently visible are countersunk and the depressions filled with crack filler. This is better than putty which has a tendency to drop out. It must be remembered that active children will subject the furniture to rough usage. There is a crack filler on the market which does not shrink and which dries as hard as concrete.

When the crack filler is dry sand all surfaces, and paint with a flat paint followed by a glossy one that will not soil easily. Colors that are light and gay are the choice for children's furniture.

When the paint is dry decorate the pieces with decals which can be had at the five and ten cent store in a wide variety of appropriate colors and designs. Decals that strike a humorous note or that have a nursery rhyme motif running through a set, are good.

TABLE OF COSTS

	¼" Plywood	3"x¾"	1¾"x1¾"	7"x¾"	12"x1"	5"x1¼"
One Table	8□'	7'	7'			
One Desk	6□'		7'	5'		
One Chair	1□'				1'	2'

	15□'		@	$.065	$ .98
The 5"x1¼" from which the curved legs were cut is hardwood. All the rest (except the plywood) is clear pine.	7'		@	.045	.32
	14'		@	.0275	.39
	5'		@	.11	.55
	1'		@	.22	.22
	2'		@	.14	.28
					$2.74

Prices New York City, October, 1942.

Save Your Fuel

[*Continued from page* 108]

you open the windows of the bedroom it'll help save fuel if you shut off the radiator in the room too. That prevents the heating system from wasting heat out the window—and that heat can go to keep the rest of the house warmer for morning. It helps to conserve heat along this line if you also push the turned up end of a rug against the bedroom door to keep cold air from getting through to the rest of the house.

Also, shut doors to the outside air promptly. You can't heat all outdoors, and if you stand at a partly opened door talking, much of the heat in the room will be lost. It's more comfortable all around if your guests say "So long" inside the house, and then go out and shut the door behind them.

Another place where heat can be needlessly wasted is in the heated garage. All you need to do is to keep the garage above the freezing point—not at the temperature of the living-room. Turn down the heat to this location so that it keeps things from freezing. That's enough.

Another heat saving stunt that many people overlook is the proper handling of the fireplace (if there is one). When you're not using it, close the damper to prevent the warm air of the room from escaping up the chimney.

Your Wartime Car

by Frederick C. Russell

Try it!

A way to test the fuel pump without wasting gasoline is to disconnect the line from the tank to the fuel filter inlet and place your finger over the latter when someone is cranking the engine. If the pump is working you should feel the intermittent suction.

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply to your letter.

Should anti-freeze be poured directly into the cooling system or mixed with water first? F. A.

Mix it first, using a two-gallon watering can. Be sure you know the cooling capacity of the engine. If in doubt, write me, giving me the model and year of your car.

Is there any way to check front-wheel camber without special gauges? L. S.

You can use a plumb line for a rough check, but gauges are better.

I have been told that it isn't always necessary to replace breaker points if they are found to be pitted. What do you say? H. B. L.

If they are not too badly pitted you can dress them with a fine grained hone. This is effective in removing the familiar black oxide which results from burning.

There is a pronounced flat spot in engine performance in the 5 to 20 mile-per-hour range. Adjusting the idling mixture fails to improve matters. S. N. L.

A likely cause of this would be having the carburetor's float level too low.

Is it all right to use two different kinds of anti-freeze? N. B. Jr.

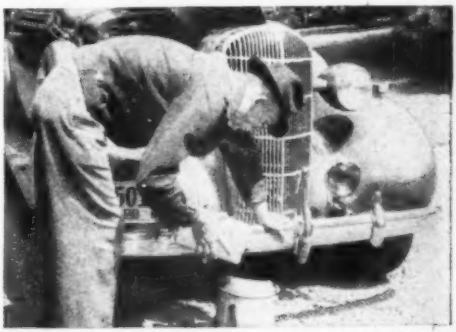
No hydrometer will give an accurate reading for such a mixture, thus making it more difficult to tell if the solution will be strong enough for a dip in temperature.

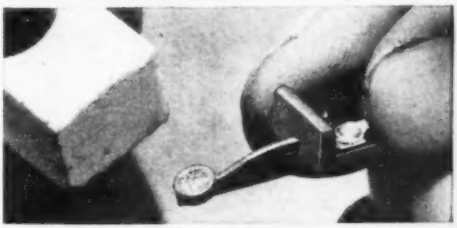
How can I check excessive condensation in the tail pipe and muffler? Have just put on the third new muffler in five years. F. L. W.

Avoid high speed and an overheated engine. Keep engine properly tuned, particularly with reference to timing. Use better mufflers. Where possible, park with car headed uphill so condensation can run out of tail pipe. Attach one of the devices for speeding up ejection of exhaust gases.

How can I remove the right rear brake drum from my car? G. L.

You will need a rear wheel hub puller. Pull should be between the hub and axle shaft to prevent damaging axle shaft thrust block in the differential.





Inside Nazi Sabotage School

[*Continued from page 38*]

the music and "cleans out" the message.

Streber went on: "Finally, after practical work in all these branches, they taught us how to communicate with one another in other ways. Invisible ink, of course, but lemon juice and aspirin are old stuff now; the enemy knows what to look for. One of our simplest and best tricks is to send a series of postcards. Each one by itself is perfectly innocent. But put together—contain a message."

I used that method myself soon after that, when I was helping to get people out of concentration camps, to communicate with an agent who prepared forged steamship tickets. It is almost infallible.

"Business firms working for us send information by means of bills, invoices or ordinary business letters, sometimes by very roundabout routes," Streber added.

This information was helpful to me a year later, when I learned, in Rome, that Nazi agents in Buenos Aires were sending instructions to saboteurs in Canada through German business firms located in Detroit, New York and Chicago.

"Another trick," Streber said, "is to send a letter addressed to some non-existent person at a wrong address, but as return address on the envelope, put the name of the person you want to communicate with. The post office 'returns' the letter to him."

Letters, I have found, offer a thousand opportunities for trickery quite apart from codes. Once, for instance, we had to send some money from Berlin to Prague (this was before the Nazi occupation of Czechoslovakia) and it had to be done without Gestapo knowledge. So in the official Nazi newspaper, Voelkischer *Beobachter*, we inserted an ordinary advertisement for a stenographer. Then we sent about a hundred replies to the newspaper box number, each one containing some currency. When we had sent the right amount, an agent of ours already in Prague wrote to the Berlin office of the *Beobachter*, using the name of the advertisement, explaining that he was in Prague and would they please send him any replies to the advertisement. The *Beobachter* obligingly bundled the hundred or more "replies" into one of their own envelopes and sent it to Prague. The censor did not dream of censoring the mail of the Nazi newspaper; in Prague our man opened the "replies"—and had his money.

Newspaper advertisements of course are a favorite secret agent device, going back to Sherlock Holmes. Right after the Canadian-Commando raid on Dieppe last month there was a report that German agents had learned of it and tipped off the Nazis by means of certain store advertisements. True or not in this instance, there is no doubt that American newspapers are used every day, in the most innocent-seeming ways, by Axis agents communicating with one another. They are much safer that way than by telephone— an instrument they are taught to avoid like the plague.

Streber speaking again: "Engineers came and taught us how to read blueprints quickly—that is, get a general idea from one glance. And they showed us, too, how to make them by drawing them in invisible ink on things like women's clothes' patterns or other innocent looking things. After that we got a course in micro-photography: how to take microphotos, develop films and above all, how to retouch pictures to disguise their real purpose. See this?" He held out his right arm for me to look at his wrist watch.

"Pretty watch," I said; "from a girl?"

He grinned. "I've just taken your picture with it."

It was a camera, a favorite with the Gestapo. Looking exactly like a wrist watch, it is actually a camera able to take 36 microphotos without reloading. They hide cameras in automobile and bicycle headlights, buttons, and even have a camera with a double lens, so that when a "tourist" seems to be taking a picture in one direction, it actually takes a picture in the other direction.

"And finally," said Streber, "we had a little shooting and ju-jitsu. That was as much as they gave us in the school itself. They took us around to factories, made us make rough sketches of what we saw, gave us dummy bridges to blow up on the test field at Klausdorf. Here's a nice trick we learned: to substitute gasoline for the water in factory fire-prevention sprinkler systems. When fire comes, melts the valves and releases the water—gasoline sprays out instead and feeds the flames!"

A similar system was used by German saboteurs many times in French factories; it is one reason today why all careful factories inspect their sprinkler systems at least once a week.

"We went out to a long railroad spur track, and learned how to throw switches, derail cars and dynamite tracks. Of course I won't do much of that 'rough stuff,' that's for the lower grade men. I'm to specialize in factory sabotage in Belgium!" He seemed pleased at the prospect; his little blue eyes danced like cold fire.

I believe Streber never suspected that I was pumping him. Nor did he ever suspect that I was anything but a businessman without any interest in who governed my country. The following spring the Gestapo did order me out of Germany for good, but for quite other reasons. I went to Italy and there, after some months, was able to use some of the Nazi tricks through the Italian underground, which, incidentally, has some very neat tricks itself—as when its men blew up the submarine oil fuel tanks at the Spezia naval base. The tanks were buried, and are connected also underground. An Italian agent managed to set the

Inside Nazi Sabotage School

first on fire in such a way that the flame traveled—underground—to all the tanks. The result was that Italian submarines operating in the Mediterranean had to be transferred for refueling some two hundred miles further away.

On another occasion—I cannot name the place—we organized the sabotage of an Italian factory making tank transmissions for the German army. It first took us about three months until we had planted four of our men as workers in the factory. What we intended to do was so tamper with certain lathes that they would grind small gears some thousandths of an inch too small. If discovered, at least the gears would be spoiled—the invaluable high-grade steel scrapped. If not discovered, the gears would go into German tanks, and cause endless maintenance difficulties and breakdowns. We did it, first, by tampering with the inspectors' micrometers so that they would not disclose the short grinding, and then by tampering with the gauges on the lathes themselves. In this way. any defective transmissions might not be discovered until they reached the tank-assembly plant in Germany. Our plan worked well, and after it had been in operation for some weeks, I managed through the Labor Corporation to have our four men transferred to factories at the other end of Italy. No one was discovered. From another agent in the factory we learned, but not till months later, that two entire trainloads of transmissions were shipped to Germany undetected.

One question that must intrigue Americans is this: if the Nazi sabotage schools are as thorough as they seem to be—and they are—why are the saboteurs caught here so stupid, as for example, the six caught landing from a submarine on Long Island and lately executed?

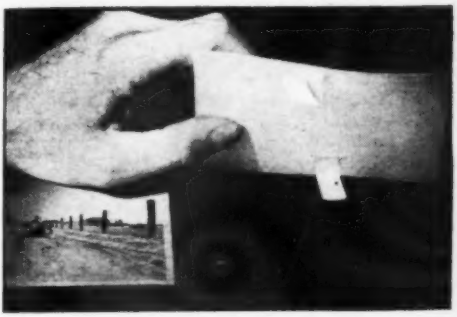
First, only a few saboteurs are caught for all those still free and operating. Second, those six men were lower-grade men easily hurried into mistakes. Third, they had typical Nazi cocksureness, a certainty of success and contempt for their adversaries—a quality that I have found from experience to be their most vulnerable point.

But executing six saboteurs by no means ends the menace of sabotage in American industry. Every industrial accident today must be suspect; those which seem "accident" even after investigation are often not accident at all, but "perfect" sabotage. The sinking of the *Normandie* was certainly due to a combination of careless guarding and sabotage—the fire began with sparks from a welder's torch alighting on loose and inflammable material lying about—a simple sabotage trick described by Streber and often used.

It is typical of Nazi planning to plan sabotage as carefully as military strategy. It must be as typical of American ingenuity as mass production, to detect and thwart it.

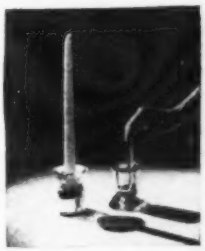
Rustproof nails for boats are being made of Monel metal.

New Products



Small new self-adhesive labels make it possible to remove photos from an album without tearing photo or page. Applied without moistening, the labels can be peeled off, re-used. For album use, a hinge is made of each label as shown.

Owners of these silver candleholders have a choice of uses for the items. In addition to serving as attractive bases for candles, as shown in the *left* of the photo, they can be inverted and used as holders for half a pack of cigarets.



Eliminating guesswork, a gauge now on the market instantly shows the size of screws. Simple to operate, the gauge is used by merely sliding a screw along a slot until it stops opposite its size on the scale. It is made of metal and can be easily carried in the pocket.

This new global map 9 in. in diameter uses no metal or other essential material. With it is a wood axis rod, transparent time dial, and wood base. A handbook and pronouncing index accompany the globe.

[*Continued from page 53*]

almost inaudible thrumming tells that you're in the air. At dawn you wake up anchored in the Thames, and Sunday evening, after two full days in England, you return on a sister ship and are back at work Monday morning.

Far, far in the future? No, day after tomorrow! Glenn Martin, builder of the *Mars*, has already designed a 250,000-pound seaplane. One step further and he says his ships will compete in cheapness and luxury with ocean liners. Designers recognize no theoretical limit to a seaplane's size.

It's staggering to contemplate how such planes will bring remote corners of the world to your back door. Twelve planes the size of the *Mars* (a mere midget, remember, in comparison to what is planned) could handle *all* the first-class passengers who cross the North Atlantic by ocean liner in a normal year! Four planes daily—two each way—can easily transport 200,000 passengers per season. With excess passenger capacity provided by larger ships, costs are bound to tumble in a gratifying way.

There may be a little freight carried on trans-Atlantic airliners, but most of it will go by flying freight train. We have heard a great deal about cargo planes planned by Henry J. Kaiser and others, but it's hard to grasp their full meaning as they will affect you.

AMERICA IN 1950

IF THE JAPS WIN . . .

. . . the perfect physical specimen will be a man of history—for disease, poverty and hunger will see to that!

IF AMERICA WINS . . .

. . . look for an advancement in science and medicine which will make our present strides seem halting. You can take your choice of which future you prefer by the number of War Bonds and Stamps you buy now!

The glider principle is just as applicable to freight as it is to passengers. Imagine an aerial freight train over your city dropping a glider loaded with pineapples from Hawaii, cantaloupes and other perishables from California, another packed with drugs from San Francisco manufacturers, and so on. Each glider is loaded only once—in the field, perhaps—picked up on feeder lines, brought to a central point and made up into trains. Numerous handlings and reloadings and trans-shipments are eliminated, effecting great savings.

Or from South Africa, from Australia, from Stockholm come individual cargo giants. They travel in the stratosphere, can span a hemisphere, and make great speed with small motors at high altitudes. Crews' quarters, of course, are sealed against low outside pressures, but a decompression chamber is provided (as it now is on the *Mars*) so that the cargo space can be inspected if necessary.

Picture one of the new freight airports with a dozen intercontinental planes lined up receiving and discharging cargo. There will be many types. Here is one whose nose swings open, revealing a great tunnel-like fuselage into which heavy freight is wheeled up a ramp. This is the design of Charles H. Babb, aeronautical engineer. Another invented by Harlan D. Fowler cuts the fuselage into sections like triple-thick slices of bread. Each section is an independent unit, can be loaded at leisure and swung into place by a crane. Still another type provides a detachable fuselage like a truck trailer, to be hooked onto a flying power plant.

Expensive? Right now, yes. It costs about ten cents a ton mile to carry freight by air, one cent by rail, half a cent by water. But Henry J. Kaiser, famous ship builder who certainly knows his cost accounting, figures that two cents a ton mile will be a fair cost for aerial freight transport.

After all, it is speed, quick turn-arounds, that wrings the last penny of economy out of air operations. A cargo plane being built by Douglas Aircraft Corporation is as big as two freight cars. But its carrying capacity is equal to a 30-car freight train; it will transport an equal amount of freight between the same two points in the same time.

And—lest we forget what is going on around us at this very moment—let Brig. Gen. Harold L. George of the Army Air Forces Ferrying Command remind you that his forces are fast on the way to achieving regular transport routes *ten times greater than all the peacetime airlines in the world!*

All this may sound as if air transport will have everything its own way after the war; but railways and trucks and buses are swiftly changing with the times too. Ocean freighters will be smaller, swifter; tankers will still be the cheapest form of oil transport. One Midwestern railway plans to use airplanes as feeder lines, connecting with towns remote from the right of way. True, there will be casualties in the colossal transportation battles we are bound to see. But another battle is going on too—the battle of metals—that will insert some fascinating jokers in the deck.

Light alloys of magnesium and aluminum will be lavishly used, but steel emphatically is not out of the picture. Many engineers see steel as the material of choice for giant cargo planes. For although it is heavier than light alloys it is tremendously strong and can save weight by elimi-

nating the need for many internal bracing members.

Railway passenger and freight cars undoubtedly will make wide use of aluminum. A steel freight car weighing 45,000 pounds weighs only 15,000 pounds when made of aluminum; thus a locomotive can pull three cars on the same amount of coal now needed to haul but one. Similar savings apply to passenger transportation. Costs go down and railways can reduce their rates to put them in a favorably competitive situation. Original cost of cars, particularly box cars, will drop like a thermometer on the Russian front. Lessons learned in manufacturing tanks have shown how to produce the box part of a freight car *in a single operation*, by resistance welding. Man-hour savings are astronomical.

There will be more than enough aluminum to go around, not to mention magnesium. This year we will produce enough aluminum to build three times the number of passenger cars now operating on American railroads, according to Dr. Charles M. A. Stine of the du Pont Company. That means we can have subways with light cars that are nearly soundproof, trucks that can haul more goods at lower cost, larger buses to accommodate more passengers more comfortably. There is also "cooked wood," that amazingly light but powerful material out of which one-piece airplane fuselages are molded and baked. A bus with a body of this stuff could, it is estimated, double its mileage per gallon of fuel.

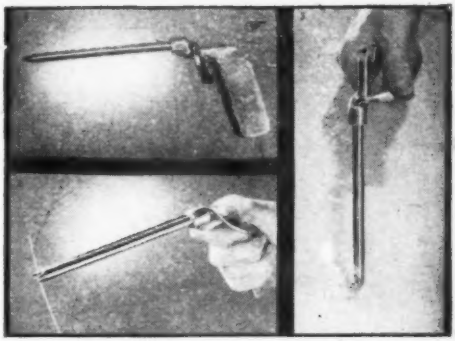
Buses will likely be of double-decker variety, ingeniously arranged for passenger comfort: remember, trains and buses will have to compete with the comfort offered by glider travel. Improved types of reclining seats with individually suspended wheels that absorb shocks through airplane-type hydraulic devices may be expected, but even more striking will be the provision of a smoking or observation lounge at the rear of the bus. Passengers can loll in sofa-type seats and view the scenery through a transparent, metal-strong plastic roof. Cross-country buses will tend toward the trailer type—that is, the passenger section will be a large unit complete in itself, to which the driver's cab and motor is hooked like a locomotive.

Air-conditioning will of course be standard on buses and trains, and lights will naturally be of the cool fluorescent variety which give off practically no heat. Interior arrangements of trains offer fascinating possibilities of customer appeal. Visibility with ample strength can be improved by making wider use of transparent plastics, carrying them through the curve of the roof. Instead of monotonous cramped rows, lounge-type seats can be placed in comfortable group arrangements.

Trucks are machines of pure efficiency and the magnificent performance of Army "jeeps" may

[*Continued on page* 160]

New Products



Light weight, flat, trigger-operated like a pistol, this new tool (1) cuts wire between edges at the muzzle, and (2) retrieves bolts, nuts, washers, cotter pins, etc., from places which would otherwise be inaccessible, the hardened steel cutters picking up the part. Leverage ratio is 15 to 1.

Workmen in dark areas have welcomed this combination flashlight and 6-ft. steel rule. The tape can be looped around the user's shoulder, or from a pipe or beam to direct light. It's good for measuring oil-tank levels, for example.

A new type of pyrheliometer for measuring the heat intensity of solar rays that reach the earth has been developed by General Electric primarily for the federal weather bureau's use. As shown here, the pyrheliometer, a type of thermocouple, looks somewhat like an electric-light bulb. The "filament" is two flat pieces of alloys only 50 millionths of an inch thick. The instrument is mounted with this "filament" or element parallel to the earth so that solar rays will strike the element at the same angle they would hit the earth. The glass bulb is spherical to provide a uniform path for the rays from the glass to the element despite their angle of approach. The angle would be different, for example, in the late afternoon from at noontime when the sun is overhead. Florists, agricultural experiment stations, painters, using infra-red rays, and others may eventually find uses for the new instrument, too, it is expected.

[*Continued from page* 159]

well result in highway freight-carriers of stark functional simplicity. Drivers' cabs will be much more comfortable and spacious, allowing the helper to rest at ease during "off" periods on long runs. The Four Wheel Drive Company has designed a cab in which the instrument panel and controls are separate units, easily removed and replaced without disturbing electric wiring.

We've got to revise all existing ideas about the efficiency of gasoline motors. That powerful motor in your car, that massive job in a ten-ton truck, may look beautiful to a mechanic but it's in a class with ox-drawn plows, flint-lock muskets and celluloid collars: that is, relic of a past age. We're getting along all right with those motors now, but brace yourself for some staggering surprises after the war.

The armed forces are building up stories of engine efficiency that will astound you when the story can be told. It's as if our present motors got their power from burning wood in the cylinders, where future ones will touch off T.N.T. Fuel chemistry has taken such tremendous strides in a mere matter of months that 115 octane gasoline has been achieved. This is equivalent to saying that the punch of two gallons of gas has been compressed into a single gallon, or even less. The fuel you now use is anywhere from 60 to 85 octane—but 115 octane fuel delivers 50 per cent more power than 100 octane.

Imagine, then, cars with motors about the size of a portable phonograph, fuel that will take you across the continent on three tanks full. The stuff that comes out of the gas station pump will be vastly different from the present product—exactly how different nobody yet knows, so dizzying is present progress in petroleum chemistry. It is certain that alcohol-gasoline mixtures of the type used in Nazi planes will be widely available, as well as Diesel fuels.

The impact of all these new transportation factors upon the post-war world is going to be terrific. Not only will your daily habits of living be drastically altered, but entire towns and cities, even the very largest, will be given a shaking-up such as they have never dreamed of

Seaport cities such as New York, San Francisco, New Orleans, have built much of their prosperity on the fact that they are shipping and receiving ports for goods from all the corners of the earth. But with glider trains and cargo planes, cities such as Topeka, Butte, St. Paul, Little Rock, Salt Lake City and Albuquerque can become "seaports" too. A load of crude rubber leaves Brazil and the cargo plane lands a few hours later in Akron. English overcoats arrive in Bismark direct from London. A Chicago distributor receives tea direct from Ceylon—and so on endlessly. These cargoes need not be reloaded, warehoused, or rehandled many times before they reach their destination. Costs go down, speeds go up—and inland cities enjoy advantages that have always been peculiar to seaport towns.

The process of decentralization has been enormously accelerated by the war. Powder plants, arms factories, airplane works and hundreds of other gigantic establishments have arisen where a few months ago were only scrubby fields. Boom towns have sprung up; some staid, quiet cities are enjoying phenomenal growth. Air transportation is making "isolationism" a thing of the past, for no part of the country is any longer remote from another.

When you can commute to work on a commutation glider train, by helibus, or fly your personal ship, you no longer need live next door to your factory or office. You may live anywhere from 100 to 200 miles away, if you choose; in terms of airtime it's no more distant than a long trolley ride. If you want to get away from crowded cities, high-cost areas, you can surely find an ideal rural homesite within a 200-mile radius.

There are many thinkers in the transportation field who believe that the automobile has passed its peak. Don't misunderstand: we will have cars, and plenty of them, after the war. But the saturation point has been passed, these authorities believe. Instead of two cars in every garage, the second one is likely to be a family airplane. The automobile will remain supreme for short trips, travel within cities, but for longer excursions it will meet the same swifter, cheaper, more comfortable competition of air travel that the car once presented to the horse and buggy.

If this is true (and the men who predict it are no idle dreamers, but hard-headed chaps who foresee that a number of big motor plants now shifted to airplane production will not return to car-making after the war) the highway as such will decline. Perhaps we will have some new through highways supported by trucks and buses, and of course new local roads where shifting populations require them. It is problematical, though, whether public opinion will support astronomical investments in elaborate highway networks when air transport enjoys the inestimable advantage of the free flyways of the sky.

No man can say postitively that "it's going to be thus-and-so", things are moving too fast. But this is certain: many old ideas, popular beliefs, basic principles that have done service for generations, are being knocked down, cuffed about and tossed into the discard. It's going to be a gloriously exciting privilege to participate in the battle of transportation that is already changing the face of the world we are fighting for.

China is believed to be the world's leading source of peppermint oil.

Salt or vinegar will not set colors in cotton goods prepared with the modern dyes, says an extension clothing specialist.

Personal Photo Greetings

[*Continued from page 99*]

greeting on a batch of cards. At the bottom of page 98 is a card made in this manner.

If the card-maker wants his greeting to be entirely photographic, he may proceed in this way: Selecting the negative to be used, prepare a small sign with the greeting and name. A copy is made of this, the same size as the picture-negative. Using an 8x10-inch printing frame or printer, mount the copy-negative of the lettering with Scotch-tape onto the upper right corner of the glass; and then mount the illustration-negative in the lower left, keeping one upside down in relation to the other, and masking the remainder of the glass with opaque paper and tape. A single-weight, "Ad-type" paper print from this composite arrangement will give an effect like that shown in the lower left corner of page 99. It is a bit confusing at first glance, but if the paper is folded in the vertical middle, exactly on the top edge of the illustration, then in the horizontal middle, on the exact edge of the side of the picture, a very neat, French-fold booklet results.

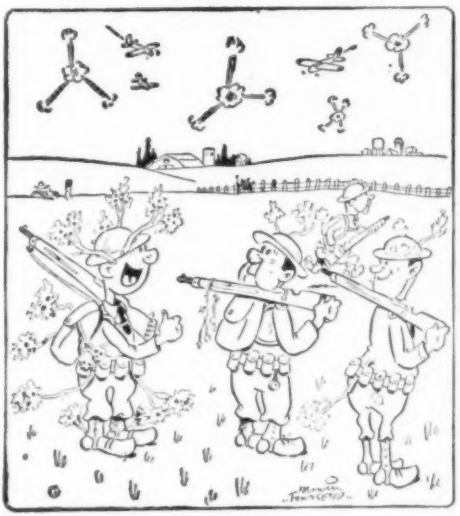
But the card-maker should not feel obliged to follow any rules. His own ideas will express his individuality best.

The really important part of the card is the picture to be used. What should it be? It may be most anything. Some sort of portrait is often used. This is appropriate if the card goes only to intimate friends, but a little less informality will be desirable if there is to be a general distribution. There are ways, however, to make the picture of a person more fitting for greeting card use. If he is shown doing something relating to Christmas, or the season, such as trimming the tree, or out in the snow, the subject will be more suitable than a conventional portrait would be. Humor may readily be introduced into this kind of picture, too, thereby taking away any suspicion of vanity in using one's own likeness. Nor need it be the maker's own likeness that is used. One's children, or his younger brothers and sisters, will solve the problem perfectly.

Snow scenes have a wide appeal. Snow transforms all it falls upon, covering unlovely details and simplifying the masses. And it is not a difficult subject to photograph. A camera with even a slow lens is adequate, for the white blanket shortens exposures. When a deep, wet snow is on the ground and trees, there are pictures everywhere. A brook is always a good center of interest, the water offering relief from the tone of the snow, and the curving lines being pleasing to the eye.

But the amateur is not limited to the outdoors. If he has imagination, he can devise still-life subjects that will be attractive. A candle is nicely symbolic of the Christmas season. Candles may be frankly realistic as at the bottom of page 98 or idealized in a symbolic still-life set.

If more human interest is desired in the still life, something suggesting animation may be included, as in the illustration at the bottom of page 99. The smart florist's shop offers such sophisticated figures, but even the "5 & 10" will yield toys that can be used in this way. In such work, the imagination must supply the plan and details of the scene, but it is not advisable to attempt to be too realistic, as the problem of keeping all items to scale will make the work very exacting. This particular illustration was made with one photoflood and two spotlights, one of which projected the rose-window cut-out, the exposure being 15 seconds at f/45 on Pan film.



"Look, fellas, I'm in bloom!"

Christmas cards are especially effective if they have some "trick," or element of surprise in them. This is natural enough, as our minds were conditioned in youth to a festival of surprise gifts. So it is desirable to introduce some feeling of novelty into the card, whether of unusual, but appropriate, subject matter, or a different slant on old subjects. The illustration at the top of page 98 shows old material, but the novelty of presentation makes it interesting. If a new angle for the picture can be thought of, the card will have a fresh and stimulating appeal. The tree-ball shows a direct reflection of a portion of a room, and was made with one 1,000-watt lamp and two photofloods, the exposure being 6 seconds at f/32 on Pan film.

This is but one of the many possible Christmas ideas that may be carried out in photographic form.

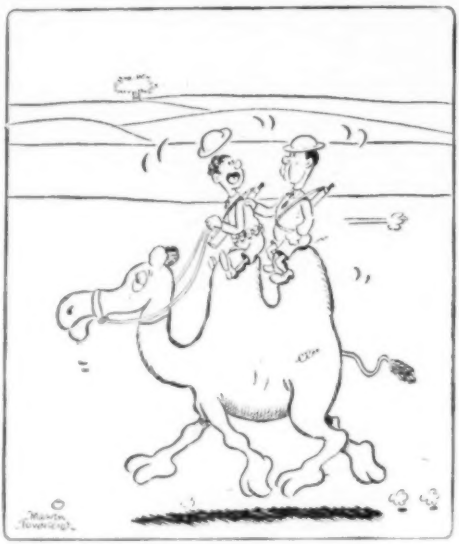
Drum Talk

[*Continued from page 57*]

lowest tones of the register, which are not far apart, or in the two highest ones, likewise close to each other. The middle tone is used with relatively few words, and so is practically negligible. Roughly speaking nearly all words can be classed as high or low; this two-tone division is the basis of the drum-language.

The two sides of the drum, chiefly because of the difference in thickness and also because of the two blocks of wood unlike in size—the "man" and "woman"—produce two distinct tones, one considerably higher than the other. These high and low drum tones can be made to correspond to the high or low tones of the language, by striking on the appropriate side of the slit. Thus the tones of the message are beaten on the drum, and the hearer reads them back into the original words. The meaning becomes clear.

It would seem that the blocks within the slit are not essential. When the drum becomes worn, and the blocks break off, the tones continue to be separable, even though less clear. Recently I have seen a large drum where the "man" and "woman" blocks were on the wrong sides with reference to the tones. Evidently the maker had made a mistake but had compensated for it in the thickness of the drum-walls. The tones were still clearly separate, though in this case the "woman" block was on the low-tone side, the "man" on the high-tone. The thickness of the walls is most important, and I have known a man, as he was making final adjustments, to chisel off a little wood from one inner side, and then to tap it to get the tone. He was tuning his drum as the piano tuner makes the adjustment of a string.



"Reminds me of my old mattress back home!"

This use of the tone of words for the words themselves explains the ability of natives to understand one another when calling at great distances. They are not hearing actual words, but rather a series of tones. In fact the Bulu sometimes employ a language, if so it may be called, of pure tone without words, to which they give the name *kili*. Individuals too far apart to hear actual words call back and forth using only the syllables "ki-ki" in the tones of the words they would employ in ordinary conversation. Short sentences are transmitted and understood. This I have watched many times, and the principle is the same as that of the drum-language.

Drum-calls are in a sort of code. In sending messages on the drum the operator does not choose any sentence at random. There are a large number of fixed expressions, either drum-names of persons or drum-sentences conveying certain ideas. The sentences have a literal meaning, but this may not be their true significance for the message. We sometimes cable a ten-letter code word of jumbled letters, or else a ten-letter word that means something; either will work, the message is to be found in the code. Accordingly, "a hill is a great thing" is a logical statement, but its real message is that a man otherwise known as Ndongo is being called. "Only folds folds hands [on] breast" may convey an idea, but it really means, "He is dead." However many ways there are of saying this in ordinary speech, on the drum there is only one, a code sentence intelligible to drummer and hearers.

These fixed code sentences are beaten on the drum, and the listeners, from the tones alone or perhaps with the aid also of the rhythm of the sentence, can decode the message again so as to seize its true meaning. The rhythm of the code sentence is the same as it would be if spoken rapidly with heavier stress on one word than on another, or on some syllable of a word. But I could detect no rhythm peculiar to the drum; and the tones, I believe, are the most important element in the recognition of the sentence.

We can understand why many young natives, these days, can neither beat the drum properly nor interpret its voice, for they have not learned the fixed sentences. Likewise the white man can scarcely become proficient in understanding them, because he must have perfect command of the language and its tonal qualities. But the native ear can, with proper training, translate the tones of the drum into the words that correspond. It takes considerable practice for a white man to recognize his own drum-name, if he has been given one.

[*Continued on page* 164]

When the Crisis Came...

DELTA MACHINES WERE READY!

★ A battery of Delta Circular Saws at the Consolidated Aircraft Corp., cutting aluminum alloy sheets.

American aviation knew that nothing short of a "production revolution" could build an air armada overnight!

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Drum Talk

[*Continued from page* 162]

Every man and most women used to have an individual drum-name, a fixed code sentence. Sometimes it seemed to have no particular meaning. In other cases it seemed to refer to one's character or some other circumstances. My father, Dr. A. C. Good, the first white man in South Cameroun, was continually traveling hither and yon in preliminary explorations. He was given this very significant drum-name by the Bulu: "Going, going, going, what are you going to look for?" The writer's drum-name was given by some old men, probably because he is an only child: "You walk alone, where are your brothers?" Women might have names referring to them as superlatively beautiful, or occasionally the opposite. Sometimes the names were handed down to younger members of a family as their elders died off. A man when asked recently his wife's drum-name replied: "No. I tried to give her one, but she wouldn't accept it, and her own family never gave her one." She must have felt that her own family should have provided it. If you were named for a certain person, you might take the same drum-name.

Check the water and hay, sir?

Code sentences serving as names are usually short, very idiomatic, and difficult of exact translation. They employ a negative form which seems ancient and is employed only in proverbs and drum-messages. With the advent of European civilization and education many old native customs are disappearing, and with them the drum-calls. The younger generation neglects the drum and consequently does not possess drum-names. As the older generation passes, first-class drummers become scarce, and it is mostly the elders who can still interpret the calls. Eventually the art may disappear.

A few examples of drum-names, translated into English, are these:

"The giant wood rat has no child, the house rat has no child."

"A witch does not eat fruit, but any man eats [it]."

"A rich man puts on airs in his own village."

"Take care of the ground, that it is which will bury you."

"Oyono must not join the fighting, I don't want Oyono to die."

"The chameleon does not shoot a gun, does not shoot a bow, what is he creeping up on?"

The stealthy gait of a chameleon as it prepares to shoot an insect with its tongue is well known. Other names refer to the francolin scratching in the forest, or the parrot raiding palms for their fruit.

Some drum-names can belong only to women:

"Even if you dress up finely, love is the only thing."

"She is better than the daughter of other tribes, she who stands there."

"If beauty were for the asking, she would have begged it from her friends."

"Fine walking without the sound of a footfall."

"The village of the rich man (or polygamist) is not without its treasures."

"She stands as Tolo stands."

Tolo is a five-star constellation, admired by the Bulu. As it stands above other stars, so she surpasses other women. The terse tonality and idiomatic brevity are lost when such names are rendered in English.

Other messages sent on the drum.

Aside from drum-names, the actual messages beaten on the drum are surprisingly few—in the Bulu country at least—and limited to certain essential information. Food is very important. Suppose a man returns unexpectedly from a journey or from hunting, only to find his wife absent in her garden off in the forest. He is hungry and may call her in this manner: first, her drum-name; second, his drum-name; third, the message as follows:

Zá a w' awulu avô, m'awô' ô zaé te ngelé.

"Come walk quickly. I feel hunger not small."

If a man is very sick, after his name comes:

A nto ane jomolo, jomolo.

"He is weakening, weakening."

If he has died:

"Ve ba' a ba' a mo tôé."

"Only folds folds hands [on] breast."

To call people to go hunting in the forest with nets into which the game is driven:

Okpweñ ô nto ngata' a ne doé, doé, doé.

[*Continued on page* 166]

Air Power for America

FLYING MANUAL No. 9, the *Civil Air Patrol* issue, is now on the newsstands! Indispensable to everyone interested in aviation, this specially-prepared edition of FLYING MANUAL explains how every loyal American can help his country to win the battle for freedom! Articles written by experts in the *Civil Air Patrol*, and in all phases of aviation, are included in this remarkable new issue, and are designed to start every patriotic and air-minded American on his way to a complete and thorough knowledge of flying.

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(CANADIAN ORDERS NOT ACCEPTED)

Drum Talk

[*Continued from page* 164]

"Little antelope is tied up tight, tight, tight."

If a woman runs away from her husband into the forest, the drum may warn others to watch and catch her:

Fé kpwabak! kpwabak!

"[Into the] bush, crash! crash!"

When a white official is coming, the drum says:

A wôé bôt élañ.

"He kills people [with] malice."

This general drum-name for a government official comes down from earlier days, when this part of Africa had to be ruled with a stern hand.

In order to warn people to kill a leopard that someone had sighted, the drum would signal:

Môt a nkele nda, ve atan, atan.

"Person he not go [in] house, but outside, outside."

A man far off in the forest might be called home as follows:

Beyeñ be nto wo jal nne, za' a wulu avô.

"Guests they are your village here, come walk quickly."

In the old days a wrestling match was a tribal contest of great excitement, but the custom died out because of governmental disapproval. The matches often led to blows or even bloodshed. The invitation used to go out over the forest:

Bulu Bulu ngam, Fañ Fañ ngam.

"Bulu Bulu on one side, Fang Fang on one side."

During the match there was always plenty of drumming, for no African assembly is truly happy without a maximum of noise. There were dance-drums made of a hollow log four feet long and covered with antelope skin. These were beaten with the hands only. The call-drums were then used mainly to accompany the dance-drums, not issuing any message. But in the hands of a skillful operator, the call-drum could be used to encourage one of the wrestlers, to warn him of a coming hold, or to advise him to take advantage of an opening. Coaching from the side lines is far older than American baseball.

At dances the call-drum is commonly employed for the same purpose as other types of drums, to beat the time. But it can also advise a special dancer, if need be, to stand up, sit down, come out, turn his back so, or stoop forward.

The actual messages that are usually transmitted by drum in the Bulu country by code sentences scarcely exceed a round dozen. The use of other than such fixed sentences would throw the listener into the mass of tones of general speech and result only in confusion. Remember that the hearer of a distant drum-call has nothing to work with but the two tones and their rhythm.

We might illustrate how the tone pattern of a drum-call is beaten as follows, using the upper level to show the syllables beaten on the "woman" side of the drum, and the lower level to show those on the "man" side:

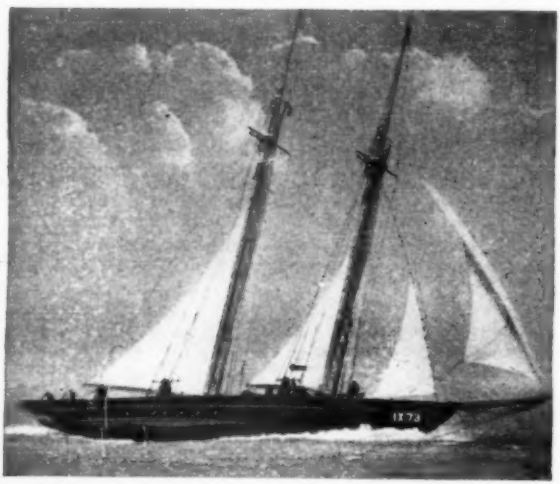
Kup be li-me-ti kup tyiñ.
te mfañ é-tom,

"The chicken has no real guilt, yet they wring its neck."

tam, be- be
W'a-wul' é- bo- nyoñ né?

"You walk alone, where are your brothers?"

The advice commonly given to drummers is as follows: Don't lean over the drum, but straighten



10,000 SKIPPERS!

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up, or its sound will be muffled. Look in the direction you wish the sound to go. Don't hold your arms against your body, spread them out, and the sound will carry farther. A good drummer must not eat chicken wings, but must give them to someone else. The flapping of a chicken's wings does not sound far, they won't help.

In olden days the drum was of great service, especially to call the people together to "talk palavers," or discuss topics of general importance and cases at law. Most of these had to do with property rights in women. A woman was sold in marriage by her father or brother. She might die without having been fully paid for; having borne children whose ownership could be questioned. Thus she was a chief topic of conversation and even dispute. "Palavers" about women lasted for hours.

In the quiet of evening or just before daybreak, when sound carried best, the local drummer exhibited his skill by calling the drum-names of all persons of importance in the vicinity, one after another, scores and scores. Each man listened for his own name, and felt injured if omitted from the roll call.

Nowadays the drum serves instead of a bell for the various missions, Protestant and Catholic. Every village chapel has its drum; and the drummer calls the roll of drum-names as an invitation to the services, thus helping to preserve the art as its older uses dwindle.

Before a recent Sunday service, I took down a list of 52 drum names, with the help of three or four men who knew drum-calls. We sat in a house, out of sight of the excellent drummer, and the men gave me each sentence before the next started, sometimes even before it was quite complete. Without their knowing what might come next, they amazed me by identifying every call within five to ten seconds. They probably knew 200 and more such names.

It was hard for me to write down enough of each name-sentence to be able to complete it later. At the end of 20 minutes I stopped the drummer, who could have continued. Later in the day a near-by chief asked who beat the drum that morning. He had noticed the difference between an expert and the indifferent drummer who usually performed.

A year or so ago I stopped in a Bulu village where a man lived whom I wished to see. But the man had been off in the forest for hours, at work in his garden. It would have taken an hour for someone to walk there and bring him back, so I asked if he could be called with the drum. A little drum was brought out from the palaver house, and the tap-tap-tap went out on the air. I waited. In a half-hour, almost to the minute, in he came.

"I heard you call me," he said. "What is it you want?"

The drum certainly can talk.

Tomorrow's Great Motorcycle Is Proving Itself Today

On the fighting fronts of the world today, the greatest Indian Motorcycle of all time is being born. You'll ride it when this war is over . . . you'll get a new thrill from the Indian improvements that are military secrets now. *It's an Indian worth waiting for!*

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Ask for this helpful booklet. It's FREE! Tells you how to get the most out of any motorcycle.

Indian
SPRING FRAME
MOTORCYCLE

Red Giants And White Dwarfs

[*Continued from page 64*]

hour of calculation showed that it accounted (calculated with most enthusiastic optimism) for not quite one hundredth of one per cent. The Sun should have "burned out" in a few years. But didn't. Meanwhile the physicist Helmholtz found a better answer. It was the energy of falling particles that kept the Sun going, not that of meteorites but of the Sun itself. In other words: contraction. The Sun kept hot by contracting steadily. Thus it could go on for a long time, even though not forever.

And now all these observations about white stars and yellowish stars and reddish stars suddenly began to make sense. Evidently stars, when young, were large and comparatively cool spheres of thinned out gases, emitting little heat and not much light, most of it reddish. Betelgeuse and Antares looked as if they were still close to that stage. Slowly contracting all the time they grew into mighty spheres of incandescent heat, like blinding Sirius. But then the radiation expenses grew too large, larger, at any event, than the contraction-income. The brilliance of the star began to fall off, its heat began to diminish. The star became yellowish, like our Sun, and grew more and more yellow in color, growing smaller, too, all the time. When it was quite small and dense it had, of necessity, ceased to contract anymore. The last heat was radiated away in a reddish glare, the surface began to show black spots where the star matter had finally solidified and only a short while later the star was dead, quite small and dark. That last stage could, of course, not be detected in the telescope since the star had stopped emitting visible radiations . . . but it could safely be assumed.

And then it might happen that two such black dead stars ran into each other in a head-on collision, or that such a black star plunged into another one not yet that old. The tremendous energies of such an impact would be enough to volatilize the matter of both stars, transform them almost instantaneously into blazing gases with a stupendous eruption of light and heat. As long as they were very hot these gases would expand, until, when slightly cooled, gravity asserted itself and shaped them into a huge tenuous sphere, ready to run through the whole cycle again.

Tycho's Star, no doubt, had been such a collision. Kepler had been lucky enough to see another one. But none had occurred since.

It was a theory that did well. It was simple and plausible and understandable. It could be used not only to explain the phenomena in the sky but also to serve for religious metaphors and philosophical books. It was a brilliant, splendid, useful and adaptable theory.

It had no drawback but one.

It was not true.

But to learn the truth about the stars something

[*Continued on page 169*]

Magic For The Millions

[*Continued from page 114*]

before actual use. Warmth increases the activity of the worm and causes the bean to be a dependable performer. The beans are inexpensive and can be obtained in city novelty stores. If you live in a small community a supply can be ordered by mail of Johnson Smith & Co., Detroit, Michigan, and similar firms handling novelty merchandise. The worms cannot live in a cold climate so readers living in the Northern States will have to confine use of the two effects to spring, summer and fall months.

So-called "spirit" messages are written on slates during Spiritualistic seances but it happens the slates must either be covered during the actual "writing" or else the work must be done in the dark. No covering and no darkness are required for this spirit slate writing trick, which makes it quite startling. A piece of chalk is merely placed on the slate and it immediately comes under the guidance of an invisible "spirit" hand, writing out names, numbers and answers to questions.

The writer prefers to use a sheet of black cardboard instead of a slate, the cardboard being entirely lacking in any appearance of trickery or preparation, which cannot be said of the many types of trick slates used for the purpose. Here is the secret; the "slate" is really quite unprepared, but the small piece of chalk is not. A small hole has been drilled in it, to take a piece of soft iron, the hole being made invisible by filling it with a chalk-and-water paste. This makes the chalk susceptible to a strong magnet, such as the small but powerful "Alnico" alloy magnets.

The most effective routine or presentation is to show the chalk and black cardboard, and ask for an oral question which may be answered by "yes" or "no." The "slate" is held as in one of the photos, which allows you to write backwards with the magnet at the back of the card, the chalk following every move on the front. After this initial demonstration ask someone to write a question on the card with the same chalk. This disarms all suspicion that either could be prepared or tricked in any manner. The "spirits" then write the answer to the question on the bottom of the card.

In this case the magnet has been slipped into the performer's trouser pocket and grips the chalk through the card while the card itself is moved about to cause the writing. As actual movement of the chalk has been demonstrated in the first experiment, spectators generally take it for granted that the card may be moved instead, particularly as the chalk remains in place without falling.

There are nearly 15,000,000 anglers in the United States.

The fur seal herd on the Pribilof Islands has grown, under United States government custody, from 130,000 animals in 1911 to more than 2.000,-000 now.

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Since early in 1942, engaged solely in war production.

These are features worth remembering after the war is won.

THE MARLIN FIREARMS CO.
NEW HAVEN, CONN., U. S. A.

Red Giants And White Dwarfs

[*Continued from page* 168]

else again had to be learned first. So that the astronomers might understand the stars, physicists had to understand the atom.

During the last years of the last century physicists began to feel suspicious about the atom. It was supposed to be indivisible, but there were difficulties. The chemists liked that idea. They had weighed the atoms quite carefully. The weight could, of course, not be expressed in fractions of ounces or grams, but it could be expressed by comparisons. If you called the weight of a hydrogen atom *1*, that of an oxygen atom was about *16*. The trouble was that it was not 16 but about 16. Or, if oxygen was taken to be precisely 16, than hydrogen was a little heavier than *1*. It was all very puzzling and more than one chemist thought that there might be something smaller than the atom—some little thing 1008 of which make up one hydrogen atom. That would solve the problem if it could be proved. But there the chemists were stuck. They could not prove it.

The physicists, finally discovering radium and radioactivity, did succeed in taking the atom apart, but they did not find just one smaller building stone. Instead, they found several. They discovered that the atom consisted of a nucleus, of fairly large mass and weight and positively charged, which was surrounded by electrons, almost massless and negatively charged. Later on other subatomic particles were added, the positively charged electron or positron and the uncharged or neutral but massive neutron. These researchers finally made it clear that chemical reactions were only reactions between the outer electron shells of the atoms. They did not touch the atom, which means its nucleus, itself.

All this has to do with the stars, because this knowledge, in turn, enabled astronomers to understand and to interpret what their spectrograms

[*Continued on page* 170]

Red Giants And White Dwarfs

[*Continued from page* 169]

told them about the chemical composition of the stars.

Just the same, the number of riddles increased. There was the troublesome case of Sirius B, or the Companion of Sirius, for example. Many years earlier astronomers had learned that Sirius described a definite path among the stars. It should have been a straight line, but close observation showed that it was not. Majestic Sirius seemed to wobble a bit. The phenomenon was soon explained by assuming that Sirius was accompanied by another star, both revolving around each other while following their straight line path. And since we saw only bright Sirius, but not its (presumably dark) companion the path looked wavy. Then the companion was found, so far the theory was proved right. And it was learned that Sirius itself, or *Sirius A*, had 2.4 times as much mass as our Sun, being larger in size, also. The small companion weighed almost exactly the same as the Sun . . . but was in size about as large as the Earth. That meant that the matter composing it was so enormously dense and heavy that it weighed at least 70,000 times as much as water, one cubic inch of it weighing about a ton! Besides, instead of being red, it shone with pure white light! It was called a *White Dwarf* . . . but *something* was decidedly wrong. Astronomers worried about the companion of Sirius . . . and they still did not know what kept the Sun going.

Worry, did not help, however. The only sensible thing to do was to keep observing, calculating and taking notes. One day it all might make sense. It did,—because physicists learned how to handle equations that tell what is going on inside the nucleus of an atom and because chemists found the isotopes. These "uneven" weights of the atoms were explained by them. There existed two kinds of hydrogen. One, the normal majority type weighed *1*, precisely *1*, the other, a rare heavy type weighed *2*, precisely *2*, but since some of the weight 2 were always unsuspected in the mixture the average weight had never come out to precisely *1* as it should have done. Starting from there chemists soon discovered that most elements have such isotopes, some of them stable (as in the case of hydrogen) some so unstable that they broke down only a few instants after having been formed.

The existence of isotopes and the equations for reactions *inside* the atom suddenly explained where the Sun got its energy. The Sun is rich in hydrogen, 35 per cent of its whole weight is hydrogen. Or, since hydrogen atoms are so light: there are 12 hydrogen atoms for each atom of any other element. The Sun consumes these hydrogen atoms; it does not "burn" them (which is an outer electron shell chemical reaction that would leave the atom itself untouched) it really consumes,

[*Continued on page* 171]

Deer Foot Lamp

[*Continued from page* 121]

Salt the leg skins well and for a perfect job, the skins should be tanned. After tanning, the skins can be soaked in a saturate solution of warm Borax-water (common commercial Borax) into which has been added a few drops of carbolic acid. The skins can be kept in this solution until needed.

Secure from a taxidermy supply house the following materials:

1 — wood core, for a 4 leg lamp
1 — inside cap plate
1 — lamp cap plate, size 2½ inches
1 — harp holder for a single socket lamp
1 — pull chain socket
2 — gimp bands, for around the legs

The wood core comes sawed in sections and ready for use, as is shown in Fig. 1. The four sections are now pulled apart, as each of the sections are used for a leg.

One end of each of the wood core sections is left straight, but the opposite end is sawed at an angle so it can be attached to the leg bone. Notice in Fig. 2-A, how the section of the wood core and the leg bone are sawed at different angles and fitted together with screws. It is important that these fit together perfectly. Do the same with each leg, keeping the skin relaxed all the time by wrapping it with a damp cloth, or kept in an air-tight box.

After you have the core fitted to each leg, fill in around the hoof and where the core and leg bones are joined, with papier-mache. The skin is now pulled up around the core and sewn together, as in Fig. 3. Filling around the hoof and joining with the mache allows the leg to be shaped correctly as in the live animal and also makes a much neater job. After the skin has been sewed around the core, it can be trimmed off even at the top, but be sure that each leg is the same height.

The four legs are now fittted together and held in place by the gimp-bands; Fig. 4-A. The inside cap plate is next attached by screws, to the top of the wood core, Fig. 4-B. The lamp cap plate is now set on top of this to give it a finished appearance; Fig. 4-C.

In a photo we see the lamp being assembled; the lamp cap plate in position and the gimp-bands being fastened around the lamp. They can be anchored to the wood core with nickeled, or bronze, screws to match the bands being used. You can use two, or three bands, whichever is preferred. Also notice that the ferrule or lamp top fitting, is made from a section of the antler of the animal from which you used the legs. Select a piece of the antler, that would fit the top, and drill a hole in the end to receive the threaded nut that screws down on the lamp harp; this nut can be held in place with model airplane or household cement.

The lamp completely assembled is shown in

[*Continued on page* 172]

HOW TO GET INTO AVIATION—NOW

by C. S. (Casey) Jones

NO. 2 in a series of advertisements describing the free training and opportunities now available in aviation. Addressed to the thousands of men and women who wish to prepare themselves for war service in this key industry.

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Training the Key Men of Tomorrow in Aviation

Red Giants And White Dwarfs

[*Continued from page* 170]

eliminates, liquidates them. The process is as strange as it is interesting. It begins with a carbon atom swallowing up a hydrogen atom. The result is a nitrogen atom (one of nitrogen's isotopes) plus some gamma radiation. But that nitrogen atom is not stable. Giving off more radiation (so-called beta radiation) it changes into a carbon atom, of another isotope than the first carbon atom. This carbon atom is then ready to swallow one more hydrogen atom. More radiation and a new nitrogen atom (of another isotope) result. That new nitrogen atom swallows a third hydrogen atom, changing into an oxygen atom and radiation. The oxygen atom, being of an unstable variety, breaks down into radiation and a third variety of nitrogen atom which then swallows a fourth hydrogen atom. But this proves to be too much, the overloaded atom breaks up, resulting in one helium atom and one carbon atom. The latter is of the kind that started the whole cycle and it loses no time in doing so again.

If you read this over once more you'll see that four hydrogen atoms were destroyed, resulting in one helium atom and lots of radiation. The carbon does not change, it just has to be there to do the work, something like the kettle in which the water is boiled.

The sun has hydrogen to last for 30 billion years at the present rate, but astronomers know that the hydrogen will be used up more quickly later on when there will be less of it. Thus they estimate that it will last for "only" ten billion years. In the meantime it will not contract at all, nor change its size in any way. But it will grow brighter and hotter all the time, as more and more hydrogen atoms per second are radiated out of existence.

When the fuel is finally exhausted the Sun *will* contract, but far beyond any expectation of Helmholtz and the other scientists of his time. Meanwhile an Indian scientist has investigated the question how much matter you can have in one lump and still have matter as we ordinarily understand the term. He found that you cannot pile weight upon weight endlessly. Most atoms are stable and can stand an awful load, but when billions upon billions of them are piled up they break down. Those in the center will be squeezed into each other like eggs at the bottom of a huge pile. The result of all this is superdense matter like that of the companion of Sirius. (Meanwhile the figure has been revised upwards, its density is now taken to be 200,000 times that of water.) As long as the atomic reactions keep going there

[*Continued on page* 172]

Red Giants And White Dwarfs

[*Continued from page* 171]

seems to be enough counterpressure inside a star to keep its core from being crushed, but once the fuel is exhausted matter cannot stand the strain anymore. It has been shown that the planet Jupiter is just about the largest body that is possible without crushing core matter.

The Sun, after its hydrogen is exhausted, will contract to a size much smaller than Jupiter, not in spite of, but because of its bigger mass. Calculations have shown that it would have a diameter smaller than that of the Earth, with a density three million times that of water. It will still not be dark then, shedding about 1,000 times as much light as the full moon does now.

This ultra-dense state is now regarded as the end of the career of a star, but they begin as feebly glowing red giants, immensely large but with a density a 5 millionth that of water . . . the "vacuum" in a vacuum tube is full of matter by comparison. Then they contract and grow hotter. When the heat at the core passes the one million centigrade mark the atomic reactions begin and the stars progress along the path indicated by our Sun at the present time and by Sirius which has progressed a little further. The end is the White Dwarf state.

And Tycho's Star? And the wonderful Star of Bethlehem?

Astronomers are not sure yet. They have a general name for the sudden flare up of stars, calling them *novae* (new stars). Some twenty stars in our galaxy flare up like that every year, attaining a luminosity about 200,000 times that of our Sun. But Tycho's and Kepler's stars were not of that kind. They were so-called super-novae, an even more brilliant display, again 10,000 times as bright as a nova. A super-nova is rare and incredible. It simply does not seem possible that a star should suddenly go mad and *outshine its whole galaxy*. But that is what a super-nova does . . . we know it from observing super-novae in other galaxies. The phenomenon is rare, but there are many galaxies and patient waiting has shown examples of such explosions.

A nova seems to be the breakdown, the collapse, of a normal star when its atomic fuel is exhausted. The balancing forces that keep the star larger disappear and, being much too heavy for its matter to carry the load, the star breaks down in itself, contracting suddenly and releasing energy that might have lasted a million years.

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Deer Foot Lamp

[*Continued from page* 170]

another photo. The lamp harp fits down over the threaded post on the inside cap plate and the socket screws down on this, holding all in place. This photograph also shows how the ferrule screws into place to give a finished appearance to the lamp.

The shade on the original lamp was made of a piece of buckskin, treated with oil to make it transparent and then cut and laced to a wire frame of the proper size. Another good shade for a lamp of this kind can be made of parchment, or they can be bought very reasonably and decorated by hand in oil colors. Many attractive outdoor scenes, or pictures of wild animals can be painted on a parchment shade, which will add much to your finished lamp.

Pear-Mallet For Kitchen

[*Continued from page* 115]

receive mounting screws. Make the mallet clip from sheet metal, and bend the two tongues to fit around the mallet head. Rivet the clip to the wall plate with three brass escutcheon pins whose heads have been filed flat. The clip can be made of wire instead of sheet stock.

Mount the wall plate near the kitchen work surface. A jar or can lid that refuses to unscrew under strong-arm twisting will usually come off easily after being tapped lightly around its circumference with the mallet. Similarly, plastic bottle caps, metal can caps, glass bottle stoppers, and other things can be loosened. The mallet can be used to crush crackers, replace beverage-bottle caps removed with the lifter, crack nuts, break hard candy, and drive a knife into a squash or other vegetable difficult to cut. The small end of the mallet head can be provided with a metal cap instead of the imitation stem so a striking surface more durable than wood is available.—*W. E. B.*

Tank-Trappers

[*Continued from page* 67]

Fabricated steel forms such as "asparagus beds" were found to be the best tank traps; but the pioneers were adapting themselves primarily to a war of movement, and could not depend on convenient, ever-present stocks of concrete and steel obstacles. Timber was therefore decided upon, and most of the training is done with logs hewn from the forests at Fort Belvoir. Again, cable was found to be the best binding material, but the pioneers decided to work more with barbed-wire, the more common of the two. A war of movement will definitely not catch these boys napping, improvisation and use of natural material is the rule here.

The tank-trap-busters vie with one another for the right to ride the buggies. As Lt.-Col. L. W. Prentiss, in charge of training at the Replacement Center put it, "They flip coins right after payday, draw straws later in the month." The most dreaded accident is one in which the

Tank-Trappers

tank turns turtle and lands at a forward angle on her doors, breaking out with a fire for good measure. No escape from such a position is possible.

The speed and power of the tank, which may be out of control momentarily as it frees itself of the obstacle, places anyone nearby in mortal peril. The pioneer platoons are warned to keep a safe distance away—even though the tank is still struggling in the trap. Lt.-Col. Prentiss notes that the purpose of the tests is not to stop tanks but to "slow 'em up and make them targets for our anti-tank guns." A stalled enemy tank on an undefended road can be freed by its crew with some labor—but a tank forced to creep along and lurch from side to side, exposing its vitals within range of our guns—that's what the Belvoir platoons are after.

Captain Daman, in charge of obstacle construction at Belvoir's Training Center teaches the men to take advantage of the natural features of the terrain, which sometimes provide unsurmountable barriers. Man-made obstacles, however, are built in two main types—the sawhorse, connected by half ramps, and held high in the middle and at the end by deeply imbedded cross braces. The crib obstacle is built in triangular or rectangular form and often filled with dirt or stone to make it solid.

On occasion, the tanks churn along obstacle areas well strewn with mines. If they don't get their treads blown off, they continue. This "added thrill" is okay with the boys. In keeping with their philosophy of crushing what they are unable to climb, they observe that all is "home cookin'" when they've licked all the traps thrown at them.

It isn't all brawn though; Sergeant Hayden and his boys study the obstacles carefully before starting their run. It is in this last-minute conference that they decide whether to plunge directly over one hurdle, straddle both, etc. Testing a road obstacle with a land battleship, minus the necessary "savoir faire" is akin to bailing out without a parachute. They accept their wounds in good form, though—one handsome trap-buster, feeling a newly acquired pigeon-egg swelling on his forehead observed "If my gal saw me now, she'd never forgive Uncle Sam for putting me in the Army."

Our frenzied adversaries who chant that we're soft, unaggressive are hereby extended an invitation to visit Belvoir's obstacle area. Sergeant Hayden and his lads will prove otherwise.

Louisiana farmers are starting to grow paprika, six million pounds of which are now imported by the United States.

Thick blue paint on porthole window glass and a dark, muddy colored gray paint on the hull are found useful in making ocean liners inconspicuous.

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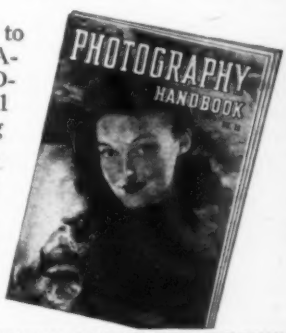

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Popular Patents

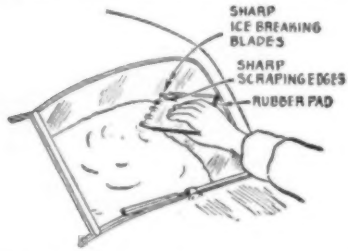
[*Continued from page* 33]

Incendiary Bullet

A bullet which is hollow instead of solid, is the subject of a patent recently granted to Frank Kowalski, Jr., of the U. S. Army. The patent, 2,288,627, describes a hollow metal bullet having a weak point which ruptures on impact. Inside the bullet is an incendiary composition which ignites when the bullet strikes an object. By means of this structure, it is possible to determine where bullets strike on a firing range or elsewhere.

* * *

A combination ice scraper and squeegee can be used to remove snow and water from the windshield according to a patent issued to Charles Osborn of Cheyenne, Wyo. The device includes a flat metallic plate having a number of projecting



ice breaking blades and recessed scraping edges at one end, and a rubber squeegee pad at the other end. With one motion, the sharp teeth break the ice, while the inner slots scrape off the broken pieces. (No. 2,277,528.)

* * *

Body Refrigerator

Localized cooling of a part of the body can be obtained by means of dry ice or a similar refrigerant, according to patent 2,288,745, issued to Theodore Sammis of Long Island, N. Y. Mr. Sammis has designed a sponge rubber container for dry ice, the container being fastened to a fabric receptacle which, in turn, is held against the body by means of an elastic belt.

* * *

Pencil-Tie Clasp

A combined tie clasp and pencil won patent 2,288,878 for Lawrence Baer of Attleboro, Mass. The article includes the usual jaw members for holding a tie against a shirt. On the outer member, Mr. Baer has provided gripping jaws for holding a pencil, or similar instrument, ready for use.

A heavy duty radial motor used in newest airliners and bombing planes contains about 5,500 parts.

Roses From Rinds

[*Continued from page* 129]

kept for several months before going further with the process.

While your stock of rinds is accumulating you can get together a number of rolled paper forms and wadded pieces of tissue paper and a large board, such as an old breadboard. Then you are ready to go ahead with the making of the flowers; except for a supply of thumb tacks, an ice pick, pair of scissors and some twine.

You must have in mind the kind of flowers you want to make so that you can cut the rinds into the right number of petals. For instance, a wild poppy has four petals, the desert primrose has three petals and the wild rose has five petals.

Now place all of the dried lemon rinds in a pan of hot water and let them soak for a half hour or until they are flexible enough to cut. When you take them out of the water thread them on a long ice pick. Then take them off, one at a time, and cut and shape the number of petals you desire, remembering to keep the rinds wrong side out throughout the process. After you have trimmed and shaped the petals then you have to place them on a mould so they will be shaped properly when dry again. For the open flowers, place a wadded piece of tissue paper in the center and fasten it on the board with thumb tacks to hold each petal down—do not stick the tacks through the rind but on the side and press into the board just enough to hold firmly. For half open flowers, shape the rind over the end of rolled paper and tie with a string. For buds, shape the rind over a smaller piece of rolled paper and tie. Then leave in the sun to dry and after two or three days of warm sunshine they should be dry enough to paint.

Have handy a colored picture of the kind of flowers you are making for a guide when painting the flowers. With a quick drying enamel, paint the flowers one at a time, inside and out, and place them on an open screen or wire frame to dry.

Wood Carver

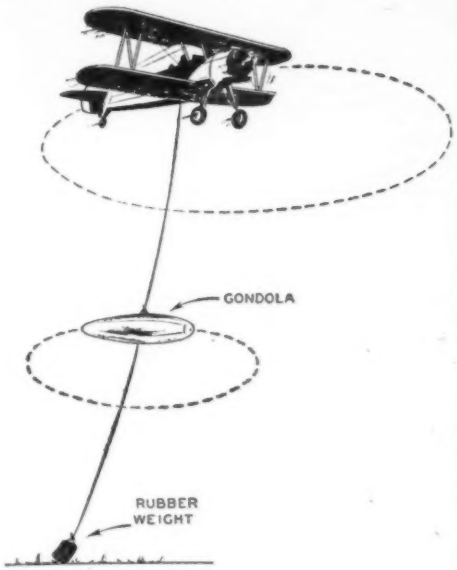
[*Continued from page* 143]

Finally a very small pointed tool cuts all the outlines around the eyes, creases, and places that cannot be reached otherwise. The back, after going through the same process is smoothed down with a few hand tools and sandpaper. The completed copy is ready for three or four coats of lacquer. The lettering, typewritten on a piece of plain paper is then glued on.

If you own a high speed rotary tool you can build a carving machine that can copy any carving, statue or irregular figure within its capacity. The simplicity of this carver makes it an ideal project for the model maker.

The only materials required are 10 pieces of wood, 8 carriage bolts and 7 wood screws. Care must be taken so the bolt holes are equally spaced.

Mail Pick-up, Delivery



A novel method by which an airplane can leisurely deliver and pick up mail or other matter from the ground without landing is described in U. S. patent 2,295,537 issued to Verne R. Anderson of Tucson, Ariz.

The new method avoids the strain and jerk which accompanies the attempt to pick up a package in a fraction of a second while on a straight-away course. By this method the plane circles above the landing point. A gondola, streamlined like the plane, is lowered by a cable. As the plane circles overhead, the gondola describes a smaller circle at a less speed. A line is automatically reeled out from the gondola carrying a rubber-like weight at the lower end. This, after reaching the ground, acts as a drag to reduce and steady the motion of the gondola.

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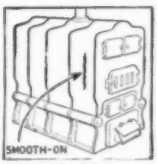

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What's The Horsepower?

[*Continued from page 130*]

a second bolt on the other side of the pulley and near the end of the short strip. With a chisel, or with a sanding drum before the pieces are assembled, cut two grooves about ⅛" deep to conform to the pulley contour.

With the arm attached to the pulley as shown, measure from the vertical center line of the shaft to a point either 1", 1.5', or 2' along the arm; and in the underside of the arm at this point drive a fairly heavy nail to act as a support resting on the scale pan. In the setup shown, distance between nail and shaft is 1½'.

With the torque arm resting *loosely* on the pulley and scale pan, adjust the scale pointer until it stands at zero. This compensates for the arm weight. If there is no adjustment, subtract the arm weight from the scale reading when the test is made.

Start the motor and tighten the nut on the free bolt until the motor behaves as if it is on the verge of losing speed. If you tighten it too much on a constant-speed induction motor, the armature will stop suddenly. If this happens, release the brake or cut the power immediately. With a speed indicator, measure the number of revolutions being made in, say, ¼ or ½ minute, and multiply by 4 or 2 to obtain the r.p.m. At the same time, note the weight indicated by the scale. As soon as you have these figures, stop the motor and let the pulley cool. Then repeat the test two or three more times, making note of the speed and pressure each time, so you can average results.

It is not always easy to hold the motor speed and scale reading constant for even 15 or 30 seconds, largely because the pulley expands under the heating action of friction and consequently increases the friction. If two operators are available, one can keep the scale reading constant by adjusting the nut on the bolt, while the other takes care of the speed reading. A variable-speed motor may be checked for power output at various r.p.m.

Determining the horsepower is a matter of simple arithmetic. The standard formula is:

$$\text{Brake horsepower} = \frac{2\ \pi\ PL \times \text{r.p.m.}}{33{,}000}$$

Where P is the pressure of the torque arms in pounds, as shown by the scale.

L is the length of the torque arm from the shaft to the nail, in feet.

r.p.m is the number of revolutions the shaft is making per minute.

2 π is approximately 6.3 (π = 3.1416).

Example: The motor shown, a rotating-field type rated at ¼ horsepower, gave the following results in one test:

Speed—1,700 r.p.m. under load of torque arm

Pressure on scale .....0.8 lb.

Length of torque arm .....1.5 ft.

The horsepower therefore was

$$\frac{6.3 \times 0.8 \times 1.5 \times 1700}{33{,}000}$$

which reduces to approximately 0.4 h.p.

The average of several tests confirmed that the actual horsepower delivered by this motor under load is about 2/5.

As pointed out in Machinery's Handbook, much figuring may be eliminated by making the torque arm a length that enables the denominator of the formula to be reduced and the numerator simplified. Thus when the arm is made 31½" long, the formula becomes:

$$\text{Brake horsepower} = \frac{\text{Pressure} \times \text{r.p.m.}}{2{,}000}$$

In prony-brake tests, the ideal condition exists when the motor delivers maximum pressure on the scale without losing normal speed.

Be careful not to overheat the pulley and motor shaft by running the test too long. The wood should be a soft variety such as redwood; and heavy grease may be used as a lubricant between it and the pulley to produce a smoother action.

Boring Tool Holder

[*Continued from page 145*]

with a hacksaw. The upper half of the hole was then opened out to ¼" to clear the screw while the lower half was tapped ¼"-20 for the Allen set screw. When the boring bar was inserted and the set screw tightened, holding the boring bar firmly in place, the tool was ready for use.

In boring operations the tool should not project beyond the holder farther than is necessary, as long overhang will tend to twist and spring the tool causing chatter and inaccurate work. When the hole is small and a slender boring bar is used, it is best to take a number of light cuts rather than one heavy one. This is especially advisable when enlarging an out-of-round hole.

In grinding a boring tool for small hole work it is necessary to increase the front clearance of the cutting edge to avoid the heel from rubbing on the surface of the cut. The exact amount of clearance depends upon the size of the hole being bored.

Ancient Rome's streets were so narrow and crowded that carts were mostly forbidden to use the streets by day—making the nights noisy with traffic.

Fish usually have no eyelids, as the water they swim in keeps the eyeball moist and clear of foreign objects.

How Are Our War Planes?

[*Continued from page* 43]

engine earned with dramatic accomplishments like the Lindbergh Paris flight) and was carried on under great difficulties. It has not yet caught up with its opposite numbers, Britain's Rolls-Royce (now also being made in this country) and Germany's Daimler-Benz.

Chief reason for the Allison's failure to become a world-leader was in its supercharger, a device for furnishing air at sea-level pressure to an engine in the rarefied atmosphere of high altitudes. When it was being developed for military use, the Allison's makers and the Army Air Corps expected it to use a turbo-supercharger (in effect a rotary air pump driven by the exhaust gases). An exclusively American development, it gave great high-altitude performance in bombers and in the larger fighters. But in the smaller fighters which the Allison was to power, its incorporation in the design of the airplane proved, for that day, impossible.

Now a two-stage, two-speed turbo-supercharger has been developed, thoroughly tested, and will shortly be in quantity production. It will vastly improve the horsepower of the Allison motor and the performance of planes powered with it. The new elaboration gives the pilot a high gear for his supercharger when his plane has climbed beyond the best limits of his low-speed blower. Today the Allison is already a vastly better engine than its critics make out; few if any other liquid-cooled power plants are as rugged or responsive to field maintenance. Since Pearl Harbor its horsepower output has been stepped up nearly 40 per cent.

Now as to specific U. S. planes:

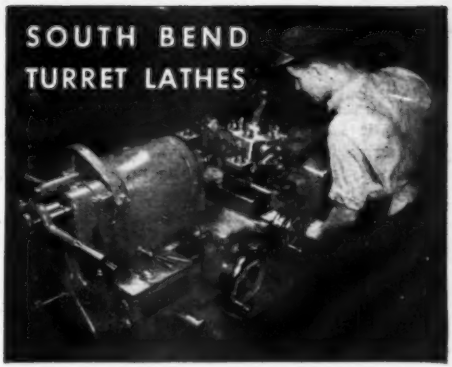
FIGHTERS

Curtiss P-40—single-engine, liquid-cooled. Most discussed of all U. S. combat aircraft, this fighter has gone through six major type changes. Best known now are the Kittyhawk and Warhawk (E and F). It has heavy hitting power, excellent armor, high diving speed, and leakproof tanks common to all U. S. combat aircraft. Against the Zero, it has proved, on the average, superior. But most P-40 pilots frankly say they would like more altitude if they could still maintain their advantages of superior firepower and protection.

Bell P-39 (Airacobra)—single-engine, liquid-cooled. A part sharer in criticisms heaped on the P-40, the P-39 has roughly the same limitations and the same positive virtues. Developments now being made in this design promise improved performance while retaining all its virtues, including splendid visibility for the pilot in missions cooperating with ground troops. Armed with a cannon as well as machine guns, it is also a powerful ground-strafing craft.

North American P-51 (Mustang)—single-en-

[*Continued on page* 178]



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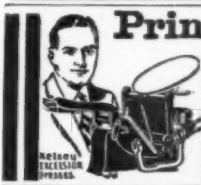

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How Are Our War Planes?

[*Continued from page* 177]

gine, liquid-cooled. Newest of the Allison-powered pursuits, one of the fastest fighters in the world, it has roughly the same limitations on altitude performance of other single-engine Allison craft. Improvement in the power plant and other technical changes promise a sensational advance in altitude performance.

Lockheed P-38 (Lightning) — two - engine, liquid-cooled. It has had only limited tests in action, notably in the Aleutians. Its performance has been brilliant. Turbo-supercharged, it has excellent high altitude performance. Its long range (exceeding that of the Spitfire Me 109, and Focke-Wulf 190) and great firepower give it real promise as escort to our high-altitude bombers. At its best altitude it is one of the world's fastest fighters. Constant improvements being made.

Republic P-47 (Thunderbolt)—powered by one of the largest U. S. air-cooled engines, the P-47 has been thoroughly tested, is in service, and in production. It is turbo-supercharged, heavily armed, and has a greater high speed than the P-38 at extreme altitudes. Its battle trial is not far off.

Grumman F-4-F (Wildcat)—single-engine, air-cooled with a supercharger. The Navy's standard fighter, as of today, the F-4-F is unquestionably the best carrier fighter now in battle service.

HEAVY BOMBERS

Boeing B-17 (Flying Fortress)—four-engine, air-cooled, turbo-supercharged. A tried and thoroughly tested model with an unequaled combat record, the B-17 has indicated by its work in the Pacific and over Europe that it can carry out high-altitude day-bombing missions under the protection of its own guns and without fighter escort.

Consolidated B-24 (Liberator) — four-engine, air-cooled, turbo-supercharged. In the Pacific, Europe, and the Aleutians, it has shown itself a top-flight performer capable of duplicating the B-17's record.

[*Continued on page* 179]

AMERICA IN 1950

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. . . your salary (if any!) probably will be less than is now paid to the Japanese soldier, Nippon's very favorite son, who gets 25 cents a month!

IF AMERICA WINS . . .

. . . the prosperity that only freedom can bring will be here for you and your family. But we *must* win! And the way to insure that victory is to buy all the War Bonds you can.

Baby Ice Scooter

[*Continued from page* 136]

First of all, the most convenient style is the shoe-skates, since they are made to fasten to a more or less flat surface and may be screwed right to the skate blocks of the scooter. Any other style may be adapted, however. When possible, choose skates with a broad blade of the hollow ground type, as these cut into the ice sufficiently to allow stability on turns. Hockey or racing skates are practically useless for our purpose due to their narrow, flat blade edge. Be sure to have the skates you choose well sharpened before installing them, since dull blades will allow the scooter to do a "ground loop" if a sharp turn is attempted.

The seat may be made from a pair of boards one inch thick and 5" x 15" secured to the top of the T-beam. A sheet iron back was nailed to the boards in the scooter illustrated here, with a ¼" iron wire rolled into the upper edge for strength. The seat should be placed about as shown on the drawing, and should not be much further to the rear as plenty of weight near the front skate is helpful when making turns to prevent skids.

The Super-B motor is fastened with bolts to the platform atop the rear uprights. (An alternate mounting for two smaller motors is shown in the drawings.) Each bolt should be locked with two nuts. To this same platform is attached the coil, condenser, gas tank, and ignition switch. The original tank on the motor was too small for the purpose and a new one made from a 2 oz. oil can was substituted. A filling of this ran the motor at top speed for approximately 15 minutes. Even this was too small and has now been replaced by one of about three times the capacity, which is much more practical.

While on the subject of the motor, it might be said that the unit used here is entirely a stock type with the one exception that a steel thrust bearing was installed by the manufacturer. The motor is designed as a tractor and when used as a pusher the modified bearing is advisable.

The throttle lever of the motor is actuated by a rod which runs up under the seat and terminates in a handle beneath the forward edge, where it is within easy reach of the hand.

A guard is built around the propeller of strap iron ¾" x ⅛" thick. The ring portion bolts to the outer ends of the rear cross piece, while the three short members run from the ring to the motor platform and are bolted at each end. If the scooter is to be used by youngsters it would be advisable to augment this guard with several lateral rings of stiff wire for further safety. The guard as shown has proven quite sufficient to prevent damage to motor or propeller during spills.

A variable spark lever extension was added to the motor and is fastened to the side of the upright, projecting forward where it can be grasped while in motion by reaching back with the right hand. This is an unnecessary refinement, however, as the spark may be adjusted to very near the

[*Continued on page* 180]

How Are Our War Planes?

[*Continued from page* 178]

MEDIUM AND LIGHT BOMBERS

North American B-25 (Mitchell)—two-engine, air-cooled. A battle-tested aircraft of speed, long range, and good load-carrying characteristics, chiefly dramatized for the public by the raid on Tokyo. No plane of the same class in friendly or enemy air forces is known to equal it.

Martin B-26 (Martian)—two-engine, air-cooled. This is also battle-tested, compares in general with the characteristics and performance of the B-25. No nation but the U. S., so far as is known, has so efficient a plane in its class.

Douglas A-20 (Boston or Havoc)—two-engine, air-cooled. A light bomber widely used by the British in the European and Egyptian theaters. Flexible in performance, it has also been employed with modifications as a heavy fighter. It is unquestionably one of the best in its class.

Douglas SBD (Dauntless) (Army counterpart: A-24)—single engine, air-cooled. The Navy's carrier-based standard dive-bomber, this craft is the best in the world in its category. It will shortly be supplemented by a newer design now in production.

Douglas TBD (Devastator)—single engine, air-cooled. The Navy's standard torpedo-bomber when we entered the war, this plane was as good as the best in service in any navy. Yet developments soon caught up with it and it is being replaced by the:

Grumman TBF (Avenger)—single engine, air-cooled. This plane made its debut at Midway. Bigger, more powerful, and in all respects more advanced than the TBD, the TBF is the best carrier-based torpedo plane so far seen in action in the war.

PATROL, RECONNAISSANCE, AND MISCELLANEOUS

The Navy's patrol bombers are the equals of any in the world, and in range—basic necessity for the work of such craft—they are probably superior. One of the Navy's types, the famous PBY, has been criticized for lack of speed. Such craft are not built for speed but for ability to stay long hours in the air and to land on rough water for refueling and servicing. In these capabilities the PBY is a superior aircraft. Its employment, however, is now overshadowed by later types, notably the new Consolidated and Martin patrol boats.

You've got the answer, then. U. S. warplanes are better than good. Very heartening, when you figure that the best you can expect and get is that our and our allies' equipment shall average superior to the equipment of the enemy. With that we shall gain victory.

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"Behind" Snapshot Awards

[*Continued from page* 103]

building, photographed by Frederick H. Gove of Concord, N. H. Although the receding perspective of the massive frame building was interesting, the lighting was rather flat and quite ordinary; hence the decision of the judges. After considerable discussion, the third prize went to LaVern Frost of Crystal, Mich., for a large, outdoor head and shoulders study of an old man, apparently a farm worker. It won out over a naturally-posed large head of a young lady.

There was a tendency on the part of the judges to pass over entries in this group which were of the "salon" type—studies that had little more than technical excellence to recommend them. Repetitions of old subjects, completely lacking in novelty went by the board—a newsboy hawking the news of war; hands, big heads, etc. On the other hand, a detailed industrial shot which composed very interestingly, lost out because of poor arrangement of the human figure injected into the scene. Here, technique was a negative factor and kept the photograph from reaching the panel of major awards winners.

In contrast to the two foregoing groups, Class C (Scenes and Still Life) produced the largest proportion of salon type subject matter right up to the first prize winner, Fig. 6 which was made by George Goodfellow, of Highspire, Pa. The winning photograph seemed to embody all of the elements of sound composition and good exposure—blending the feeling of bleakness and cold with the eye-appeal of a fine etching. The runner-up was Mrs. Bessie W. Callaway of La Grange, Ga., for her excellent "portrait" of a cluster of flowers in a field (not illustrated). The third prize winner was a water scene with a boat in silhouette by Forrest R. Brauer of Richmond, Va., which was more or less along classic salon lines as were the various lesser prize winners and "also rans" in this class.

Class D was one of the more difficult groups to judge, owing to the varied tastes of the judges. Hackneyed subjects were ruled out of the Major Awards group by unanimous consent—basketfuls of cats and dogs, etc. The pair of lambs against the sky (Fig. 7), by Florence Higgins of Grangeville, Ida., appealed by reason of its simplicity and beauty. The composition is sound and the fleecy cloud trace adds an extra something to the mood of the scene. Second prize went to the shot of the winking owl (Fig. 8), by Gordon Carter, Dallas Center, Ia., for its sheer novelty and lack of complication. Fig. 9, by John P. McDermott, New York, N. Y., third prize winner in this group was novel as well as humorous, but the background adds a slight note of confusion and the softness of the figures also detracted.

Class E brought out a top-heavy proportion of contributions by soldiers in comparison to the response of men in other services of the armed

[*Continued on page* 181]

Baby Ice Scooter

[*Continued from page* 178]

proper setting after the motor has been started and warmed up, and will be correct for most conditions thereafter.

The last item to be added is the brake. This consists of two pieces of strap iron 1" x $\frac{3}{16}$" bent to a hook shape at the bottom end and bolted to each side of the vertical member of the T-beam. To their upper ends is attached a 15" length of broom handle. It is only necessary to have about 1" clearance over the ice at the bottom end when the brake handle is pushed forward in the running position. The brake handle makes a fine thing to hang onto when in motion, and particularly when turning corners.

Absolutely no trouble has been had in starting the motor, even after it has stood idle in weather well below freezing. One of the main reasons for this is, no doubt, the fact that a good husky six volts was available for the ignition system. The coil is the standard three volt type, but the extra voltage appears to do it no harm, probably because it is run in the cold where it cannot overheat. The battery, in the form of a "hotshot" style unit, is fastened just in front of the motor upright.

The propeller was cut from a hardwood blank of the dimensions shown. It is assumed that the builder knows the science of propeller carving (see Model Builders' Manual, No. 3, page 28) so no detailed instructions should be required. The prop may be cut either left or right as the motor may be made to turn either direction; the one shown turns counter-clockwise as viewed from the rear of the scooter and was cut this way as the builder is left-handed.

This about finishes the job except for painting. The scooter illustrated was painted aluminum throughout except for the prop guard and brake which are bright red.

A few hints on operation might be in order. First, when starting the motor always have the scooter headed into a bank or other obstacle. If this is not possible, turn the front skate crossways. The usual procedure of retarding spark and choking is followed. After the motor starts, allow it to warm up for a minute then open the throttle wide and adjust spark and needle valve for top speed. The throttle on the motor specified allows it to be controlled perfectly throughout the speed range right down to an easy idling rate. As the gas level in the tank changes, the needle valve requires readjustment. Some sort of float feed as used in automotive carburetors would be a great help here and would obviate the need for such resetting.

A push is a great help in getting started, although the scooter will start from a dead stop with full load by its own power.

When making turns at full speed it is advisable to lean forward so that plenty of weight is on the front runner, and inward in the direction of the turn. It is surprising what a spin will be produced if these precautions are not observed!

"Behind" Snapshot Awards

[*Continued from page 180*]

forces. However, a robust sea subject did turn up (Fig. 10), by E. W. Kowalchik of Muskegon, Mich., which won second prize in this class by reason of its forcefulness and evident activity. A wide variety of scenics at training camps and activity shots made on maneuvers found their way to the National eliminations. The closest that any activity shot came to success was the third prize winner in Class E—a shot of a group of soldiers reading one man's letter from home. It was by Corp. Tom Tsuda, Honolulu, T. H. Unfortunately, one of the soldiers in the group insisted on looking into the camera instead of looking at the letter in question, as the others were doing.

The five judges represented diversified interests and activities in the photographic field. Colonel O. N. Solbert judged in place of Major General Dawson Olmstead, Chief Signal Officer of the U. S. Army who is in charge of Army photographic activities. Other members of the panel were Eleanor Parke Custis, well-known pictorialist and salon exhibitor; Thomas W. McKnew, Assistant Secretary of the National Geographic Society; John S. Rowan, eminent pictorialist and President of the Photographic Society of America, and Kenneth W. Williams, director of the photographic studios of the Eastman Kodak Company.

Before beginning their deliberations, the judges were advised that subject appeal was to be the important factor in the judging—the greatest interest to the greatest number of people. Technique was to be a secondary, contributing factor only. First, the judges examined the entire selection generally; then they took up each class in turn, selecting "honored" prints and major award winners by eliminating those that did not meet with their approval. Eventually, the first prize winner in each group was selected, and from among these, came the Grand Prize winner.

The future of the Newspaper National Snapshot Awards has not yet been decided. It may be suspended for the duration of the war. However, it is a very popular and productive event and worth your attention when it is announced again, as it most surely will be when we attain victory. This backstage story of the judging may well be clipped and saved for future reference. For, the basic facts about the prize-winning prints illustrated and discussed, apply to almost any type of photographic contest.

Sanitary Phonepiece

To maintain a telephone mouthpiece sanitary, Jacob Siez and Shirley Grossman of Philadelphia, Pa., have designed a molded unit of absorbent material charged with an antiseptic substance. The new mouthpiece, described in patent 2,288,975, is so shaped as to enclose the entire interior and exterior of the usual mouthpiece.

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Wee War Weapons

[*Continued from page* 149]

shaft winds the cord around the shaft and raises or lowers the gun as shown.

Fig. 11 suggest a simple conversion for a tank. Wallboard sides with track mechanism painted on make this a simple job to build. The entire rear end of the tank is left open so the operator can propel the wagon in the usual manner and the regular steering handle is retained since it is effectually hidden by the tank's superstructure. Miniature pursuit planes lend themselves best to scooters and sidewalk bikes which can be banked in quick turns to simulate real airplane flight. Individual builders will have their own ideas on carrying out this particular conversion but Fig. 12 offers a suggestion of the possibilities.

All these miniature war machines should be painted to approximate actual army coloring and insignia. If cardboard is used to carry out lines where sharp curves occur it should be of heavy stock and adequately painted for protection against the weather.

The final project is the rapid fire Pom-Pom which fires ordinary table tennis balls obtainable at most dime stores at a very small cost and having the double advantage of being incapable of causing injury and readily fired by even a light spring.

Fig. 8 shows scale drawings of the gun and Fig. 10 shows the general appearance of the gun (with the magazine detached for sake of clarity) as well as details of the construction.

The principle of firing is simple. The magazine containing 10 balls, besides the one already in the breech ready for firing, has a spring feed arm which tends to press the balls up into the breech. As each ball is fired another takes its place until the magazine is empty. Actual firing is obtained by successive cocking and releasing of a firing pin or bolt which is held in tension by either small coil springs or by heavy flat rubber binders. The firing pin has projecting guide arms which slide in slots cut into the sides of the breech block. The cocking lever, of spring steel wire (music wire) is rotated by turning a small hand crank. The cocking lever, or rather arms—for there is one each side—engage the rear guide arms and draw the bolt back as the crank is turned. When the firing bolt reaches the end of its travel in the slotways, continued turning of the crank forces the springy arms over the guide arm and releases the bolt. A piece of felt on the striking end of the bolt prevents damage to the ball which, due to the impact of the striker bolt and the natural resiliency of the balls, attains a fair muzzle velocity.

Details of the breech block are shown in Fig. 9. It may be made from a single block of pine or in two pieces and joined. In boring for the barrel care must be taken to get a snug fit to the outside diameter of the cardboard roll which serves as the barrel. Table tennis balls generally run about $1\frac{7}{16}$" diameter. Therefore the barrel should be not less than $1\frac{1}{2}$" *inside* diameter and not more than $1\frac{9}{16}$" for best results. Best to check with balls purchased previous to construction.

A couple of guide pins driven through the breech block to each side of the firing bolt will keep it centered. The breech block is bored clear through and the open rear end closed with a piece of half-inch stock as shown. Parts may be nailed, screwed or glued together and no particular precision is required in the construction.

The magazine drum is built up of two outer disks and two inner rings both having an outside diameter of 7" and both cut from about $\frac{1}{8}$" wood. Cigar box wood is suitable. Slots for the feed-arm travel are cut in all pieces and a slot for the spring end which projects to engage the feed-arm on one side should be cut into one outer disk only. Covering, inside and out, is of thin sheet or (last resort) heavy cardboard. Cut away details of the drum and feed arm are clearly shown in Fig. 10.

Paint the whole gun blue-black or dark gray and mount to suit on tripod or post stand. Not much spring tension is required for firing and the exact amount is best determined on the job as is also the exact flexibility necessary in the cocking arms in order that they are stiff enough to force the firing bolt fully back and yet flexible enough to bend free and release the bolt at the end of its travel.

Can You Hitch Up A Horse?

[*Continued from page* 141]

in the order given. The hold-back strap wraps around the shaft and through a loop on the under side, as shown.

PONY CART

This smart little vehicle should be finished in natural wood, an effective job being achieved with maple strips over mahogany veneer. Assemble with brads and casein glue. Shafts are of hickory, first scroll-sawed to the curve shown in the side view, then steamed and bent as shown in the top view. A substantial wheel can be made, as illustrated, on the lathe. First screw a wood disk to the face plate and true it, then screw a second disk of hardwood to the first disk. A block of hardwood has been glued on for the hub, and a dowel installed between the two larger disks to prevent hub slipping around when the material between hub and rim is cut away. Drilling for the spokes is done before the rim and hub are removed from supporting disk.

The lamps are blocks of wood painted black with aluminum paint on the button molds serving as lenses. A red spot should be painted on the rear side. Springs are simply dummies scroll-sawed from $\frac{1}{4}$" hardwood, and the main load is carried on a bracket under the body, drilled for the steel axle. To complete the job, install a wood whip-socket on the dash, drilled for a whip made of bamboo or seasoned twig.

This Is A Small Boat War

[*Continued from page* 78]

Twenty five have already been sent down to Venezuela to haul rubber out of the upper reaches of the Orinoco.

Albert Hickman hammered at the doors of official Washington with a torpedo carrying sea sled design as far back as 1914, and one of Captain Mustin's 55 ft. sea sleds tore out of Hampton Roads with roaring white cliffs of foam curving and falling astern at 60 miles per hour and a Caproni Bomber aboard that suddenly swooped from its tiny deck and climbed into the sky, in 1917.

Incredible, but true!

However, it has taken the present conflict to bring plane carrying inverted V bottom sea sleds back into the picture. It is believed by many competent naval men that the sea sled hull is far superior to the present V bottom P. T. hulls especially in rough water because it creates an air cushion and eliminates the tendency to slap down hard as with regular V bottoms. Being concave from the front the entire sea sled hull rides the cushioning air that is forced under it at high speeds pushing up along the entire hull length and providing a level riding boat, clearer vision with most wash and spray going to the stern plus a speed 12 m.p.h. faster than stepped hydroplanes or plain V bottom P. T. hulls.

Take a tip, the new *four screw sea sleds* are really something! And don't be surprised if in the near future you hear a lot about the exploits of 70 to 80 ft. baby battleships carrying besides their usual battle complement and torpedoes a light 100 h.p. seaplane with two 50 lb. bombs aboard cradled on the after deck to be launched or taken aboard in most any sea weather via a hinged ramp over the stern.

The Navy already uses for some of these boats a new type of propeller with blades that can be adjusted to any angle or completely reversed while the boat is in motion.

Such a large and various little navy requires a great number of first class small boat tars. Who are these bold Hell and High Water fellows who refer to a few feet of bunk as home, who work, eat and sleep in tough, uncomfortable little cubicles, like living in a rocket?

They come from the same ranks as that group of small boat owners who decided recently to form a privateer sea-raider navy of their own and petitioned Washington for arms for their boats and permission to tow old hulks fitted to resemble tankers out to sea as decoys to lure enemy subs in where they could "get a crack at 'em."

Under 35, they are picked for good eyesight, gas engine knowledge, seamanship and ability to resist speed and seasickness. Most small boatmen already have raw courage and the essentials of seamanship but it is necessary to give them something of official naval routine and discipline.

[*Continued on page* 184]

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This Is A Small Boat War

[*Continued on page* 183]

Otherwise, straight from the shoulder fellows, they would see nothing wrong in pulling up alongside the Admiral's flagship and asking, "What the Hell is next?"

Disciplined thoroughly to the spirit of the ship every man is specially trained for teamwork. Mile-a-minute torpedo blitzing in the face of enemy fire requires the most exacting timing and co-ordination. There is no time for reasoning. Action must be instinctive, based on long skillful training.

Wearing scoot suits of zippered special waterproof coat, pants, helmet, goggles and face mask with only slits for eyes, nose and mouth, crouched forward, knees flexed as they dart in to battle an Axis Goliath they must appear to the surprised enemy as mad gargoyles mounted on streaks of lightning.

"I know that right now with even a few hundred P. T.'s the whole marine picture for the United Nations would change immediately," says H. Scott Paine, eminent, world famous designer.

"Why, just one of the little devils can do as much damage as a Flying Fortress loaded with block busters," a high ranking naval officer stated in presenting an E. award to a Pacific Coast builder; adding, "Where it takes a fast plane nearly a mile to turn around, these bantams turn in twice their own length, shoot down low flying planes and will if necessary tackle singlehanded any battleship afloat."

With increasingly large numbers of small boats being rushed to fight the Navy's biggest battles, in the immediate future thousands of men of raw courage in little super-boats will hold the spotlight and be the most decisive factor in winning the war in the South Pacific.

Able to marshal a small boat armada of 100,000 boats ranging from 25 to 150 ft. and able to build new reserves at the rate of over 30,000 a year if something happened to every single battleship, cruiser and destroyer of our big Navy we have a complete little midget navy able to carry on a devastating all-out attack against enemy naval forces in the Pacific and maintain it relentlessly until the last of the Japs have been chased from the seas.

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Precision Pocket Trammel

[*Continued from page* 144]

one of the triangles to a base. Make a hardwood strip from which to cut base blocks and use two pieces as templates in locating the second triangle. The other guides are set in turn with these pieces. Cut the slide blocks to length and sand them until they will slide freely, but without play, in the grooves. Also trim the base to size, and draw register marks on the ends, centering on the grooves, with which to locate the trammel on the paper. Screw a strip of plywood beneath for clamping to the drawing board.

Drill the T-shaped blocks for bearings, to fit the smooth parts beneath the heads of bolts used for cabinet door knobs. Pass the bolts through the bearings, run on washers and nuts to take up end play, and screw the slide blocks on tightly. The threads on the bolts will cut their way if holes are bored a little smaller than root diameter. Cut off the ends of the bolts and file them flush. Obviously this assembly is made after the bearing blocks are inserted in the beam. Glue the inner block permanently at the square end of the short slot. The other bearing is movable, and clamped in position by a small machine screw passing through a loose hole in one jaw of the beam, and threading into the other jaw.

The pencil holder clasps the beam, where it is locked with a screw in the end. The pencil hole clamps by means of a saw kerf and horizontal screw.

Resonant Line Transmitter

[*Continued from page* 150]

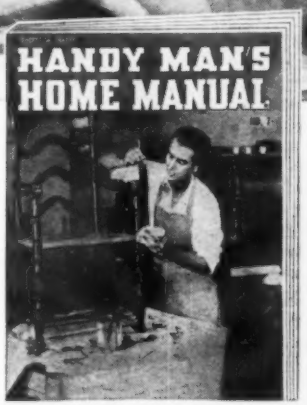
layout will put the frequency in the band, but tube characteristics may make some tuning necessary. If not, then attach a small variable condenser, C2 (10 mmfd. maximum), across the plate lines next to the socket. These lines are, of course, bridged across at their outer ends.

A voltage of 300 is maximum at this 224-mc. frequency; 200 volts will prove more stable. In tuning, use a plate milliammeter and watch for the lowest dip when using the filament-cathode line condenser C1. Test for oscillation with a neon bulb touching the plate line. It will be found to glow brightest with the plate dip at about half scale.

The hair-pin antenna pickup loop can be mounted on a pair of stand-off insulators and coupled close to the ends of the plate line and parallel to it. This coupling should be as loose as possible with a moderate rise in plate current.

Either one of the bridges of course can be adjusted along the length of the two lines for desired frequency adjustment. When this has been determined for final operation a suitable modulation and speech unit can be connected into the B plus lead and conversation carried on on the 1¼-meter band. For many reasons this band will prove superior to the 2½-meter band.

KEEP THE HOME FRONT IN GOOD SHAPE!



HOME repairs and reconditioning are more important today than ever before, because keeping your house in good shape means a vital saving in the precious time and materials needed to win the war! But, with manpower as scarce as it is, the real patriot is going to be the man who knows how to do things for himself, the man who knows how to work with his hands!

The new HANDYMAN'S HOME MANUAL, now on sale at your newsstand, is designed to meet to a "t" the demands of a stepped-up war effort. Filled with countless ways to keep your own home front in tip-top shape, this modern book sells for only 50 cents and has 146 profusely illustrated pages on furniture, woodworking and other projects of interest to every craftsman as well as beginner. How to save fuel in the home this winter, how to do over old furniture, how to accomplish dozens of simple household repairs without using war-needed materials or outside labor—these are but a few of the timely and useful subjects covered in this book!

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Your Invention Clinic

[Continued from page 12]

properly. Usually, it is merely necessary for you to disclose your idea with sufficient clarity to a patent attorney and let him do the rest. If the matter is not made plain to the attorney, he will ask you to answer a number of questions which will give him a clear picture of the product which you want to protect.

It may take a year or more to get your patent. Your attorney will notify you of all actions which he takes.

Rocket Planes

Mac Wolak of Middletown, Conn., has designed a rocket plane based upon the popular youngsters' throwing arrow. He has conducted some experiments with this modified design and asks for an expression of opinion.

ANSWER: *The application of rocket power to airplane flight has progressed far beyond the experimental work which you have thus far carried out. The difficulty of controlling your unit, which you have found to be a real problem, has been fairly well licked. The greatest factor which has prevented rocket power from rapidly coming to the fore is that of supplying the necessary gases at high velocities in a constant stream. A combination of gasoline and liquid air in a specially designed engine seems to be most efficient to date. Before continuing further with your experiments we would recommend that you read all of the literature on rocket power. You will then realize that you must start on a much higher rung of the ladder of rocket flight progress.*

"Ah, champagne! You get the glasses and I'll wring out the bumper."

Gear Coupling

Byron Strong of Savannah, Ga., tells us that he had designed a gear mechanism which will maintain two motors at constant speed and any hunting of one automatically is corrected by the other. He writes: "If you think I am working on something worth my time and effort a little encouragement from you is all that I need to get started in earnest."

ANSWER: *Unfortunately, your communication did not contain enough details upon which a concrete answer can be given. If the idea presented is purely a gear mechanism which will automatically compensate for motor variables, it is likely that you are working upon a product very much worth while.*

We would suggest that before carrying on costly experiments in this field, you have a patent search made to determine whether or not there are similar controls already protected. You should also look into the field of synchronization where all sorts of mechanisms have been utilized for insuring an absolute constant speed of recording motors and for operating scanning disks in television equipments.

To have the motor variably control the gasoline feed supply, a valve or a resistor is entirely too slow an operation.

If you would care to send us further details we will try to make our reply more specific.

Gasoline Gun

Ben Tysk of Buffalo, N. Y., says that he is working upon a machine gun operated entirely by gasoline and he asks for our advice.

ANSWER: *This idea is not new. It appeared during the last war, possibly even before then.*

Unfortunately, in these suggested mechanisms there is not enough power in the force of the explosion to send the shell over any satisfactory distance or to produce the needed penetration. Nevertheless, you may have an original design which would greatly augment muzzle velocity. If this is the case further experimental work would be recommended.

Campers, motorists, and others who use forest areas are blamed for 90% of the 191,000 forest fires occurring in a year in the United States.

A mystery fish, the Acrotus, a stream-lined, scaleless fish so rare that only five have been known to science, has been caught off Monterey, California.